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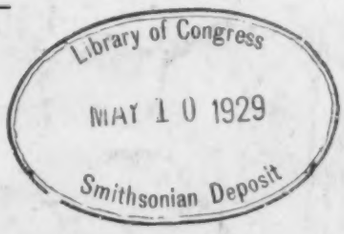

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For Sheboygan, Wisconsin

THE Byllesby Engineering and Management Corporation has contracted with The Koppers Construction Company for a By-Product Coke and Gas Plant to be installed at Sheboygan, Wisconsin.

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BY-PRODUCT COKE AND GAS PLANTS

Chicago Pittsburgh New York

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Vol. 130, No. 5 **May, 1929** Whole Number 3665

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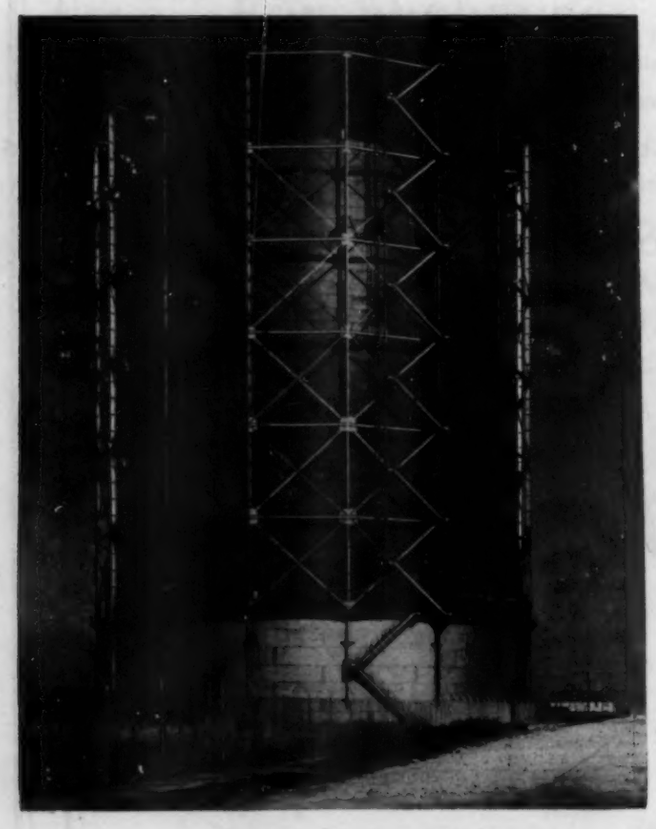

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AND
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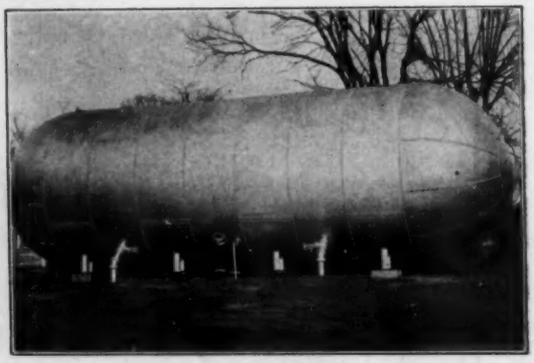

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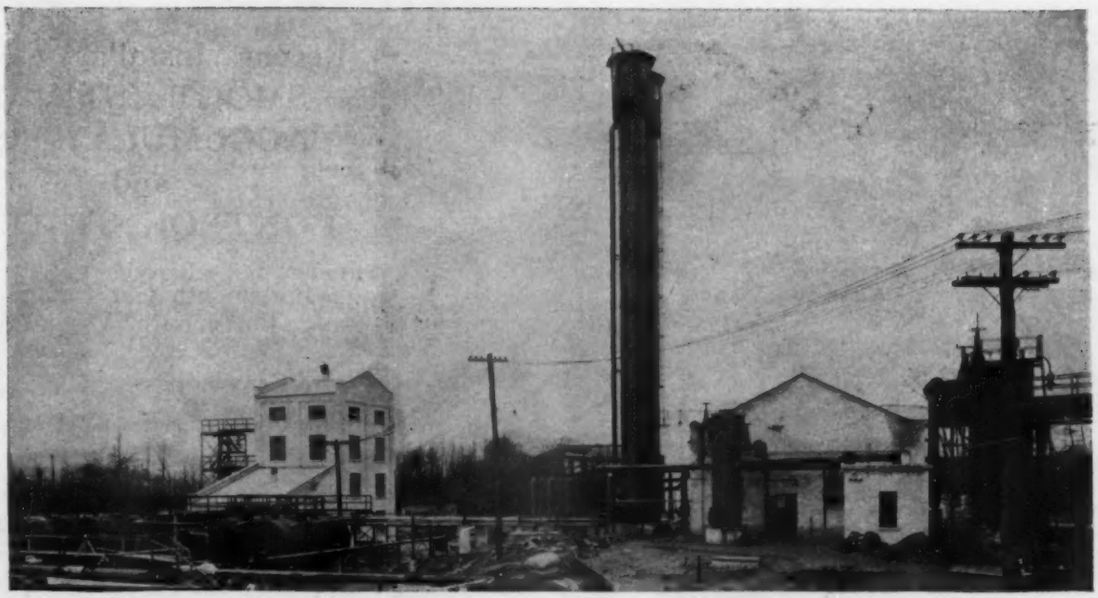

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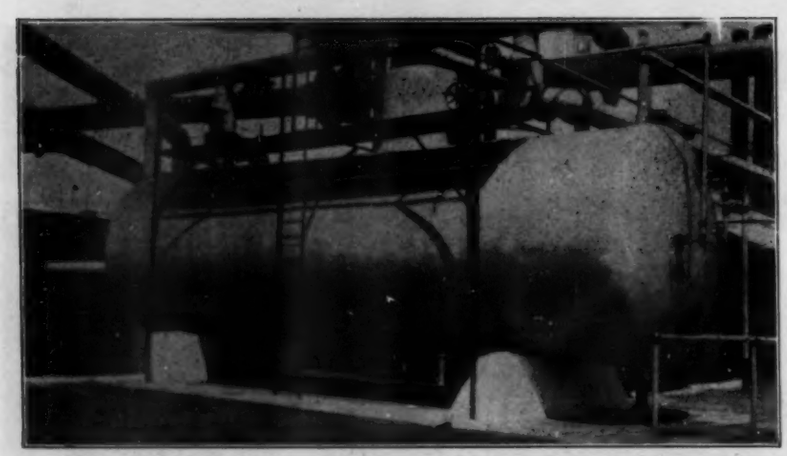
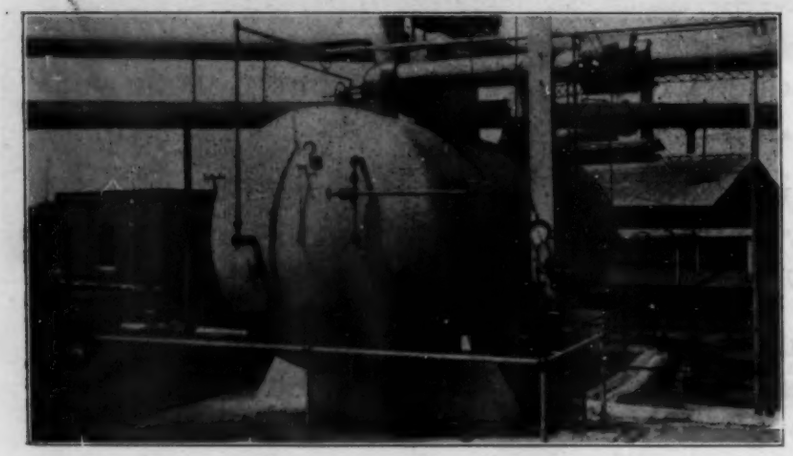


Smoot Steam Accumulator at the Georgia Power Company, Atlanta, Georgia. The United Engineers and Constructors, Inc., Engineers.



Smoot Steam Accumulator at Georgia Power Company, Atlanta, Georgia, showing Smoot control regulating steam pressure from accumulator to water gas machines.

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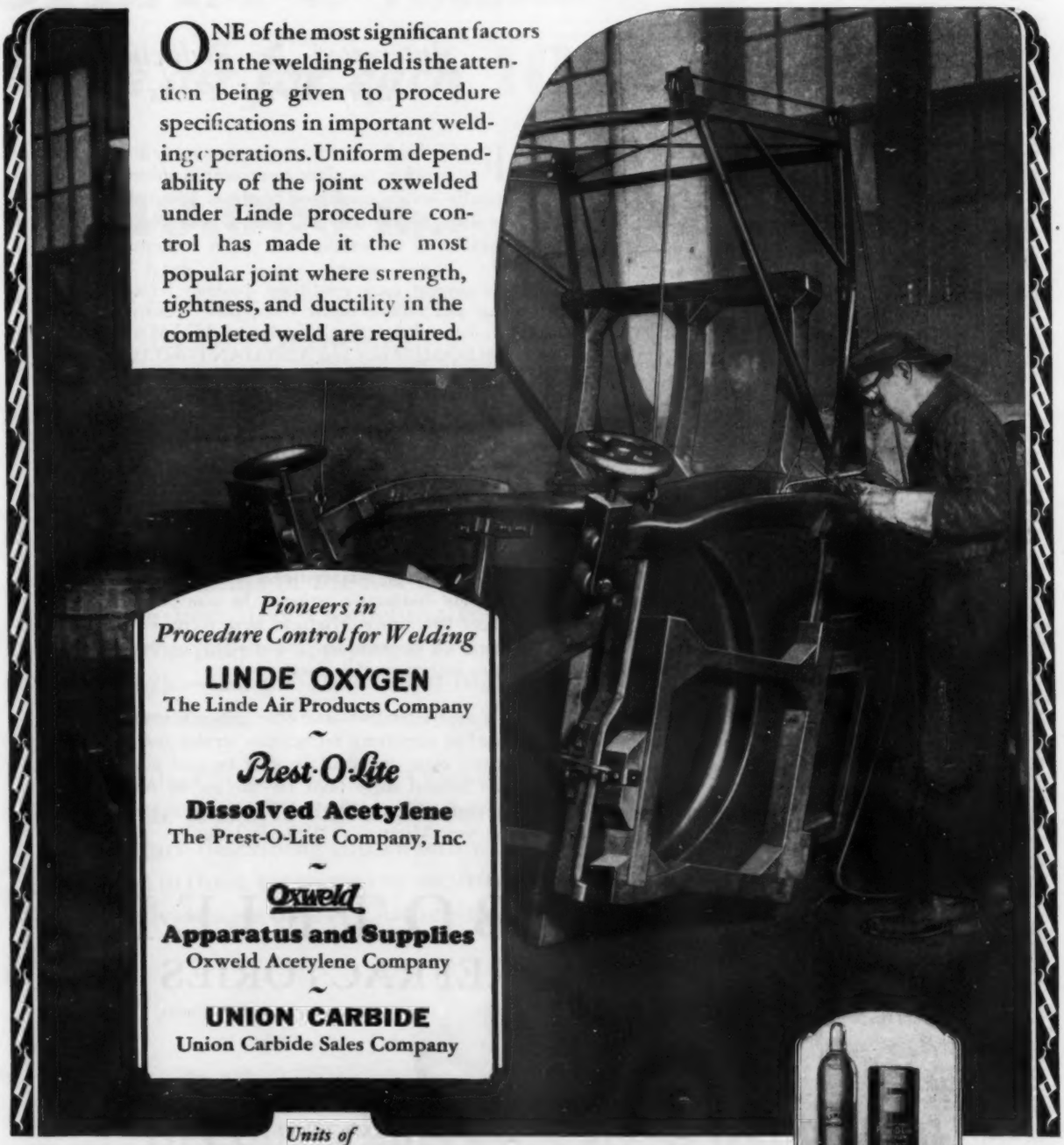

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A Message to

SUPERINTENDENTS

Interested In Reducing Refractories Costs

FIRE brick construction in water gas machines and in other gas plant equipment is subjected to unusually severe conditions, such as low-melting fluxes or slags, fusible coal ash, clinker adhesion, erosion and abrasion of descending fuel (as in generators).

To combat such conditions, prolong refractories service and reduce repair costs, many plants are using the Super-Refractory Mixtures of ADAMANT-ADACHROME *Fines* and ADAMANT-ADACHROME *Aggregate*.

Mixtures of ADAMANT-ADACHROME *Fines* are used for laying up the brick. Mixtures of ADAMANT-ADACHROME *Aggregate* are employed for surfacing or coating applications, blown on by means of The ADAMANT Gun, and also as patching mixtures.

Gas Plants use the ADAMANT Gun (Price $25.00) for applying coatings of ADAMANT - ADACHROME *Aggregate*. Mixtures in boiler settings, generators and other equipment employing refractory construction.

ADAMANT comes in 100 lb., 250 lb. and 400 lb. air-tight metal containers, ADACHROME *Fines* and ADACHROME *Aggregate* are shipped dry in 125 lb. paper-lined burlap bags.

These Super-Refractory Mixtures have demonstrated unusually high refractoriness and ability to withstand severely destructive actions. In many instances, these Super-Refractory Mixtures have increased the life of fire brick construction, and effected worthwhile reductions in refractories costs.

To superintendents and other gas plant officials interested in improving refractories service and minimizing repair costs, we shall be glad to send complete data and helpful suggestions for the use of ADAMANT Cement, The ADAMANT Gun, and the Super-Refractory Mixtures. Write us today.

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REFRACTORIES CO.

Swanson and Clymer Streets,
Philadelphia, Pa.

For a Long Furnace Run, Use The ADAMANT *Gun*

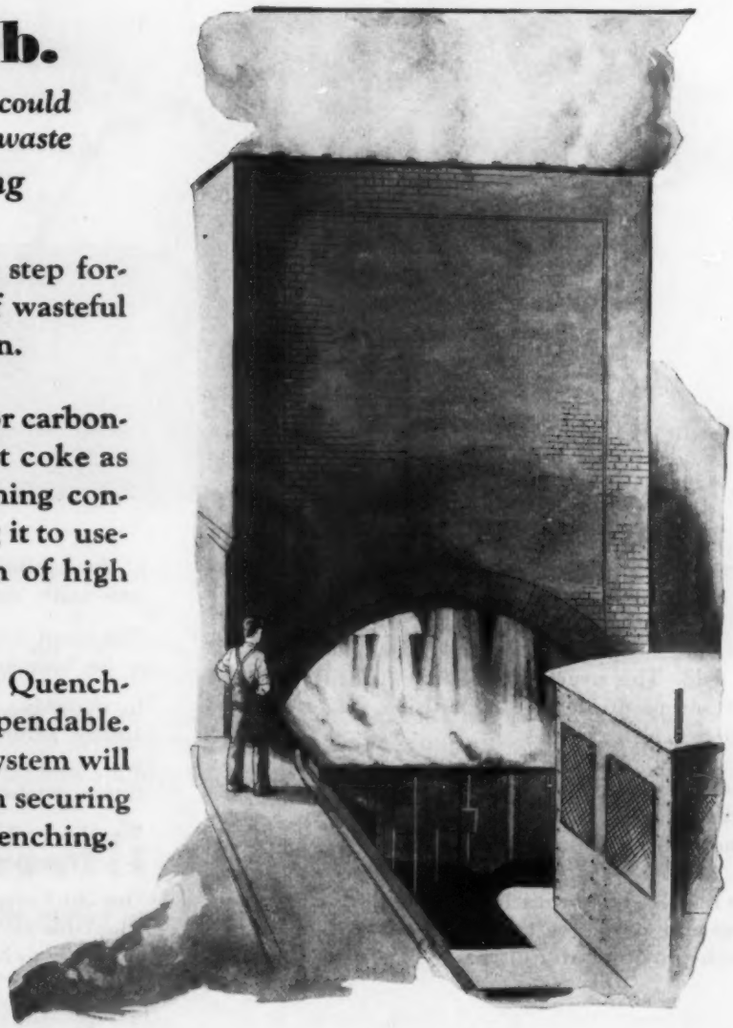
ADAMANT
FIRE BRICK CEMENT

Whenever You Use a Fire Brick, Use ADAMANT, *the Original High Temperature Cement*

275,000 cu. feet of STEAM is released to the air for each 10 tons of COKE wet quenched

10,000 lb.

of high pressure steam could be produced from this waste by Dry Quenching



Dry Quenching is another step forward in the elimination of wasteful methods in coke production.

40% of the heat required for carbonization remains in the hot coke as sensible heat. Dry Quenching conserves this heat by applying it to useful work—the production of high pressure steam.

The Sulzer System for Dry Quenching coke is simple and dependable. Literature describing this system will be sent to those interested in securing the advantages of Dry Quenching.

Dry Quenching Equipment Corporation

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Oxide for filling is handled into the boxes by a bucket elevator conveyor, mounted on the Gantry crane used for lifting and transporting of the covers.

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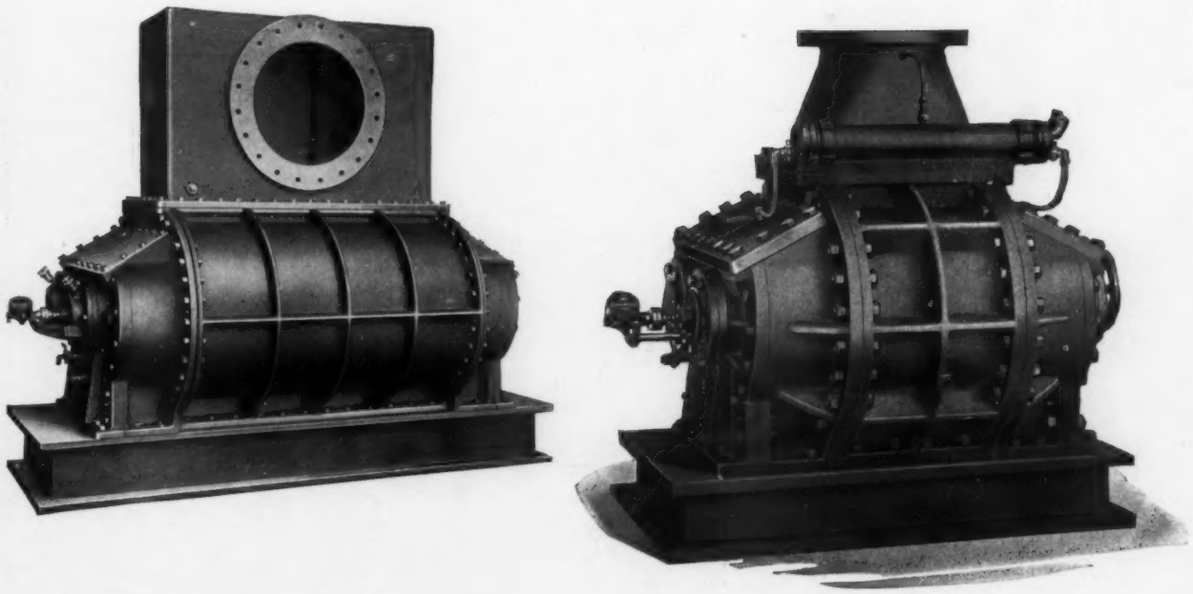

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Simplicity of design—no complicated mechanism to require frequent or difficult adjustments.

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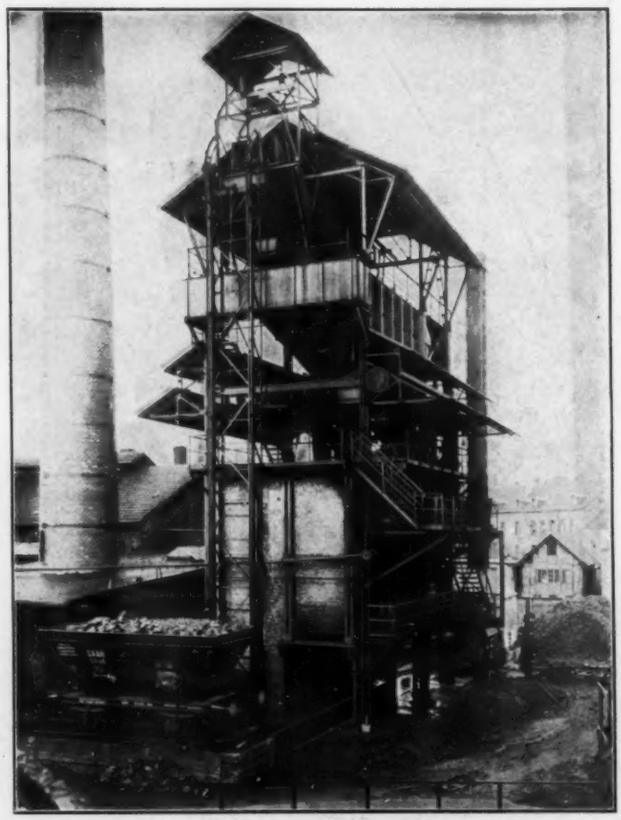

Minimum Labor
Low First Cost

The annual operating reports of the Association of Swiss Gas Plants disclose that the "INDUGAS" ovens produce the largest yields of gas per ton of coal.

The following table shows the actual average yields from coal containing less volatile matter than the average American coal:

City	Time	Yield cu. ft. per net ton	Heating value B.t.u. (gross)
Baden, Switzerland	4 years average	14075	560
Olten, Switzerland	2 " "	13317	570
Friedrichshafen, Germany	4 " "	16045	515

There's a Reason

Full information, layouts and estimates gladly furnished

INDUGAS COMPANY, INC.

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Installation by

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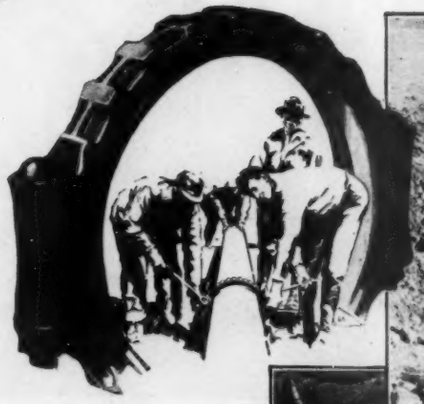

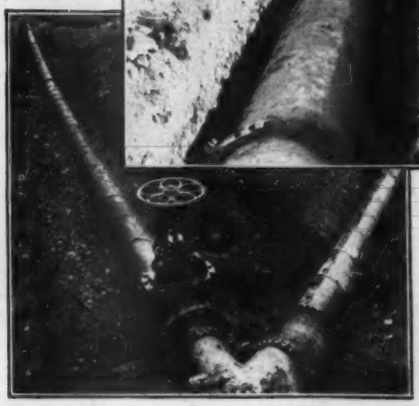

20" gas discharge line of Sinclair Oil and Gas Co., Seminole field.

12" spiral weld steel salt water line of Brooklyn Ash Removal Co., Corona, New York.

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For water, gas, oil, sewage or compressed air—high pressure, low pressure or vacuum—using steel, spiral weld, wrought iron or cast iron pipe—Victaulic couplings are your best assurance of a permanently leak-proof line.
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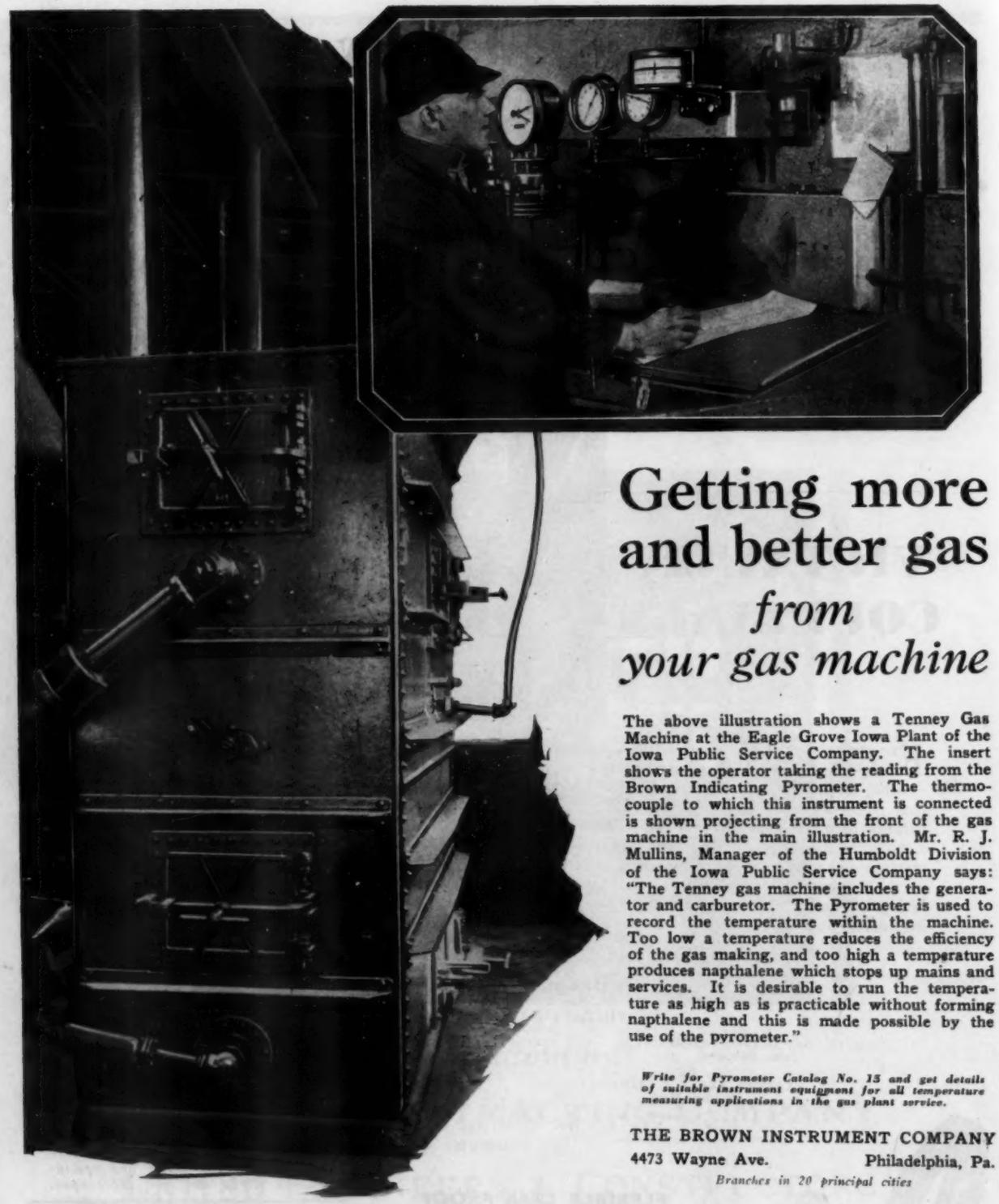

Getting more and better gas *from your gas machine*

The above illustration shows a Tenney Gas Machine at the Eagle Grove Iowa Plant of the Iowa Public Service Company. The insert shows the operator taking the reading from the Brown Indicating Pyrometer. The thermocouple to which this instrument is connected is shown projecting from the front of the gas machine in the main illustration. Mr. R. J. Mullins, Manager of the Humboldt Division of the Iowa Public Service Company says: "The Tenney gas machine includes the generator and carburetor. The Pyrometer is used to record the temperature within the machine. Too low a temperature reduces the efficiency of the gas making, and too high a temperature produces napthalene which stops up mains and services. It is desirable to run the temperature as high as is practicable without forming napthalene and this is made possible by the use of the pyrometer."

Write for Pyrometer Catalog No. 15 and get details of suitable instrument equipment for all temperature measuring applications in the gas plant service.

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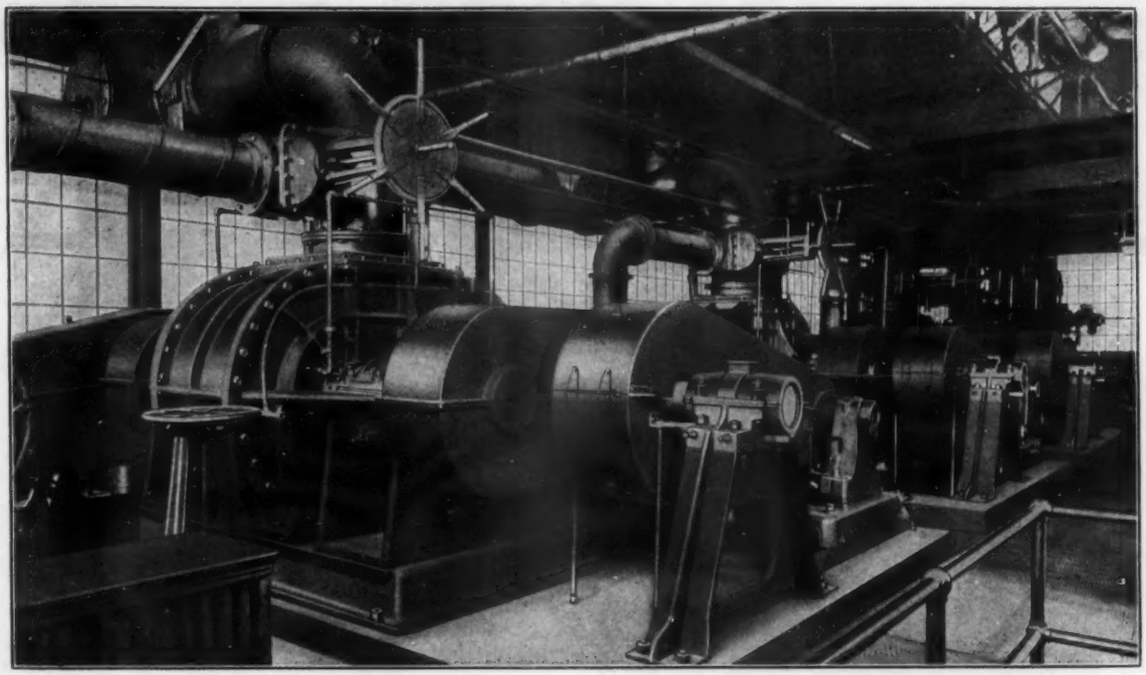
4473 Wayne Ave. Philadelphia, Pa.
Branches in 20 principal cities

Brown Pyrometers

"To measure is to economize"

ROOTS



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Three Roots No. 11 Heavy Duty Gas Pumps each delivering 37 Cubic Feet per Revolution against 10 lbs. Pressure in Central West Plant.

Roots Service

Roots service is dependable, satisfactory service. From conception to the finished product every detail is carefully wrought and inspected.

Oversize shafts, heavily ribbed cases, adjustable self-oiling bearings, sturdy gears of *conventional* 14½° involute tooth design, exact clearances, and the absence of internal friction mean added service from Roots Gas Pumps.

Secure the best by specifying that it be a Roots product—regardless of whether you need a Gas Pump, Meter, Vacuum Pump, Liquid Pump, Blower, Gate, Valve or Coupling. Write for details.

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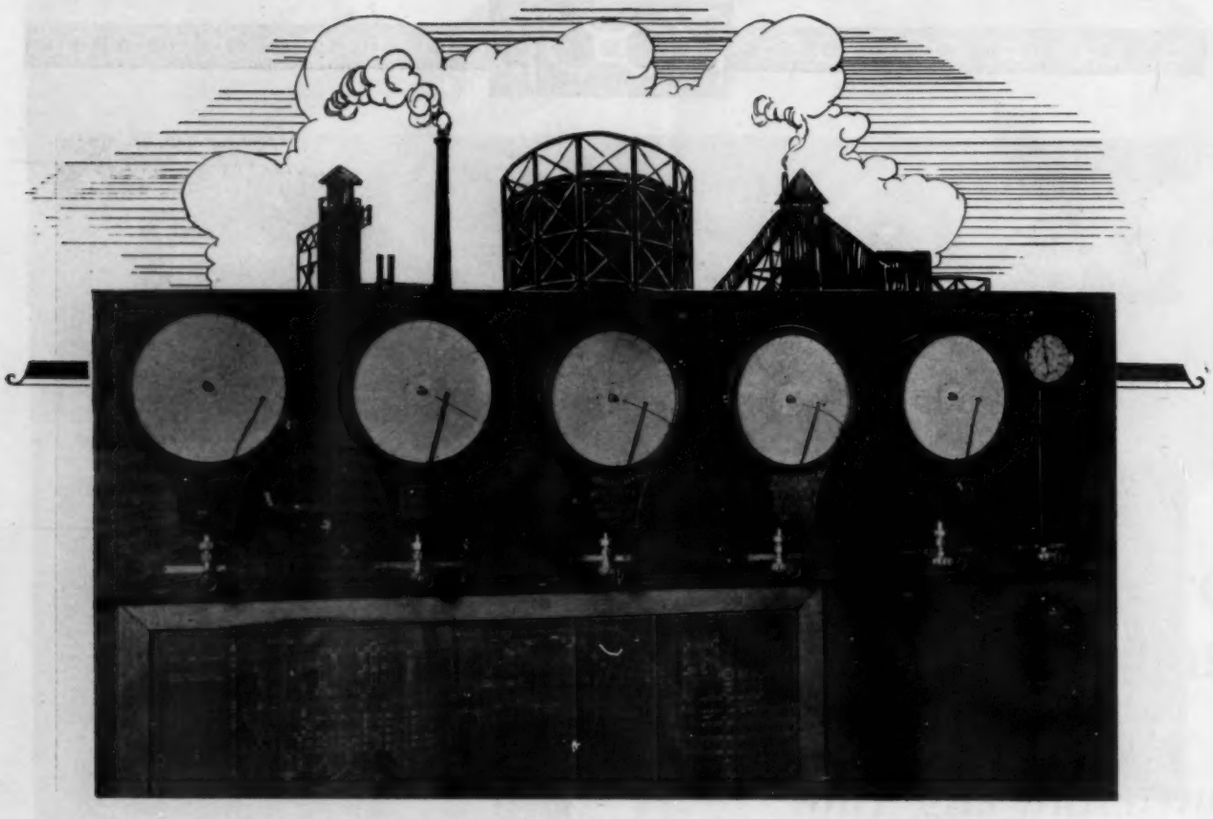
120 Liberty Street

Originators of the Double Impeller Rotary Principle



The installation as shown is used to check high and low pressures on gas lines in regulator station; also to record pressures on high side of line ahead of the regulator and on low side of the line after gas has passed through regulator.

Recording Instruments to aid in Reducing Operating Costs

IN every process of making or distributing gas, or reclaiming of by-products, economical operation is largely dependent upon strict adherence to pre-determined schedules of pressure, temperature, motion, speed, etc.

To continuously record these conditions; to show what is taking place inside the gas-making, purifying or distributing equipment is the function of Bristol's instruments.

And testifying to the marked appreciation of what such instrument service can accomplish are the thousands of Bristol installations now in use throughout the gas industry—Gauges to record foul main, process and distribution pressures, etc.—Thermometers to record temperatures of seal pot, washers, scrubbers, ammonia stills, tar extractors, station meter, etc.—Recording Pyrometers to guide in obtaining efficient retort, carburetor and super-heater operation; also to check waste heat escapement from retorts or flue—Tachometers to indicate the correctness of compressor speeds—Mechanical Motion Record to show extent of holder movement, etc., etc.

In a word, Bristol's Recording Instruments show the why and wherefore of operation efficiency; pointing out not only where improvement is needed, but—once the correction is made—acting as a guide in keeping things straight.

Bristol's Equipment can be furnished to take care of almost any instrument need in the gas industry. Designed with a view to simplicity of operation; having dust—, moisture—, and fume-proof construction, operation should continue accurate and satisfactory for years, with very little care and adjustment.

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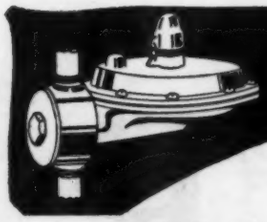
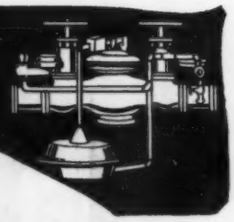


Gas Control Since 1892



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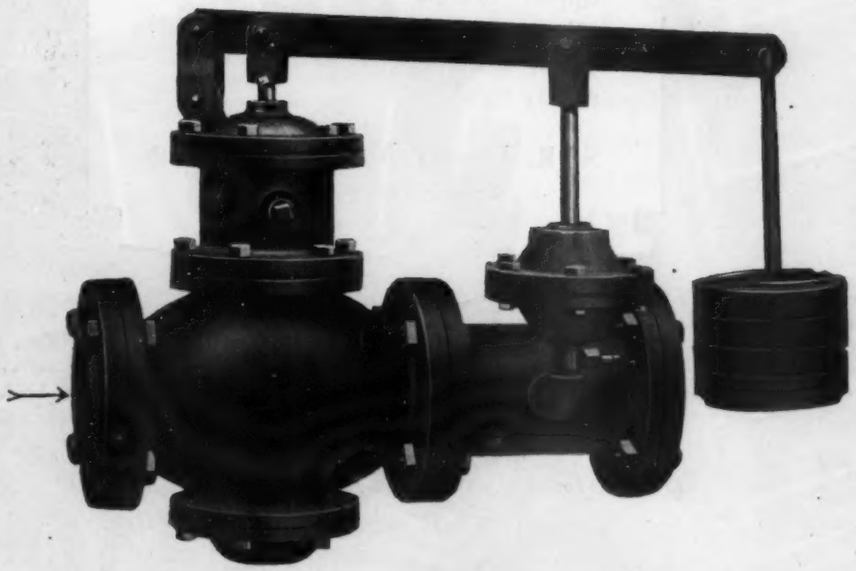
HUNDREDS of this type of Regulator are still giving perfect performance after more than 20 years of service. Improved in details—workmanship to higher standards of precision—yet the original model was so nearly perfect that years of experimenting have changed the original only in detail. The REYNOLDS High Pressure Line Regulator is unequalled for use in industrial hook-up where it is necessary to maintain uniform delivery pressure—reducing pounds to pounds. This Regulator insures positive lock-off plus unusually sensitive regulation.



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Gas Holders

View of Main Plant, Located at Baltimore

AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900.

HENRY M. RILEY, *Editor*

Important Decentralization in Management of Subsidiaries

ABSENTEE LANDLORDS have never been popular. Distant holding-company managements of public-utility subsidiaries have often fallen under a similar cloud of criticism. It is very difficult for the best-intentioned holding company to operate a distant subsidiary with full satisfaction, either to the public served or to the personnel of the company staff. Unless there be actually resident in the territory of the subsidiary a capable spokesman of the management with ample authority to settle problems as they arise, troubles of inconsequential nature are likely to grow to alarming proportions. This is a widely recognized but an often-neglected principle. It is gratifying, therefore, to see certain outstanding holding companies of the country giving fresh recognition to this fundamental of good management and accomplishing a substantial decentralization of operating management.

This trend toward the establishment of district managers with generous authority and substantial resources at their immediate disposal should do much to offset a serious tendency of the times in the public-utility business. We refer to the tendency to operate companies with primary consideration for the influence upon the stock market rather than upon the quality of the service and the real efficiency of operation.

In these days of abnormal stock speculation, rapidly changing money conditions, and many corporate consolidations, there is need for close attention to fiscal, stock-market, and general corporate affairs. This job is, however, one quite distinct from the job of subsidiary management. Indeed, at times it seems as though long-time local efficiency is directly opposed to day-to-day benefits in Wall Street's appraisal of the company's stock. This apparent conflict is merely an indication that Wall Street is speculating and not investing. It should be so interpreted, and the Wall Street opinion which bears upon trends during the next few months can safely be ignored when it conflicts with long-time efficiency or permanent good service.

There is only one important precaution which needs emphasis when considering the trend toward decentralization. This has to do with the selection of district or local managers and the authority granted them. It is very important to pick a man of real capability and to pay him generously. With such a man on the job there need be no limit on the authority granted. The manager will do his job better if unhampered by red tape and can be trusted, if he be the right man, to consult with headquarters if there is any doubt as to the propriety of proposed changes in policy or planned settlements of problems.

Are There Too Many Gas Conventions?

WE BELIEVE there are! However, the serious difficulty with present-day meetings of gas men is not with the number. The difficulty lies in inadequate coordination and insufficient preparation of the programs.

Affiliation of state and district gas association with the A. G. A. has been very helpful. However, there has not yet come about a sufficient coordination in program planning. It is gratifying, therefore, to note that the New England gas men have made one further move toward coordination by the holding of their spring technical meeting as a part of the Distribution Conference of A. G. A., held in Boston recently. This joint meeting may have deprived New England technical men of some little opportunity for conference and personal exchange of opinion; but this was much more than offset by the increased attendance and the increased value of the meetings which resulted for all who attended from distant, as well as nearby, points.

There is still large opportunity for further consolidations of gatherings in this fashion. In every part of the country transportation facilities are so good that it is as easy, and almost as cheap, to go 300 miles as to go 50. The expense in time and money is largely in the stay at the convention, not for the travel involved. Hence, we can very well reduce the number of gatherings held in each section of the United States to a minimum in order that we may make each gathering of maximum usefulness with good attendance and the best of programs.

So far as AMERICAN GAS JOURNAL knows, there has never been a frank conference of district and state association officers with the A. G. A. officials devoted solely to the question of reducing the number of programs and to effective coordination of program material. We believe that there should be such a conference. We believe that not later than the A. G. A. meeting in October there should be set up a program for the next season's convention activities, which would comprehend all of the past activities which are worthy of attention and consolidate them into a limited number of gatherings.

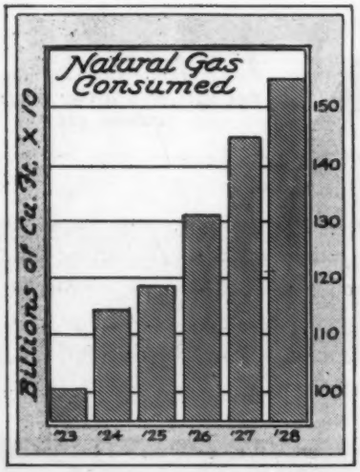
These gatherings, other than the one general convention of A. G. A., should be of two sorts, regional and functional. The regional conferences should be so planned as to bring together the largest number of junior executives and young staff men of promise so that they will be given the inspiration of contact with the big men of the area and the fresh stimulation which every conference of this sort can afford.

The programs for such local gatherings should be somewhat diversified, including technical, management, merchandizing, accounting, and chemical material, so that all the classes of men present will get something really worth while on their specialty. But emphasis should not be placed upon serving the specialty of any one man. The result sought should be, rather, a broadening affect upon each individual so that he will see the industry as a whole and understand the problems in other branches of activity than his own.

There have already been developed fine functional conferences on production, distribution, accounting, and natural-gas subjects. These should be continued. Such conferences are largely doing away with the necessity for the multiplicity of afternoon meetings at the annual general convention in Atlantic City. A proper placing of these functional conferences at strategic points throughout the United States will serve to diversify the attendance, to make each available, at least occasionally, to every interested gas man, and to stimulate enthusiasm in the several districts of the country. These functional conferences can be extended somewhat further than they have yet gone. When this has been done, we may finally attain an arrangement for Atlantic City which has long been sought by the manufacturer-company backers of A. G. A.

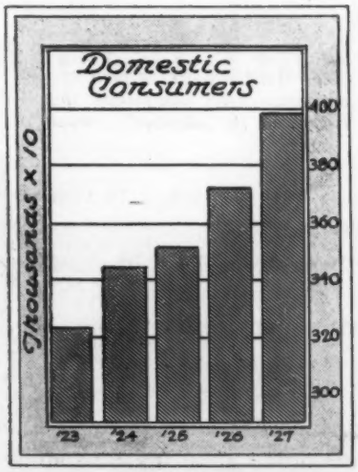
We refer to the need for having free time available for those in attendance to view the exhibits carefully and at their leisure. The manufacturers spend several hundred thousand dollars in preparing their exhibits, purchasing space, and attending the convention. The exhibitors are entitled to get a real response from the whole industry in return for this money. They are not at present getting quite full return because at practically every hour when the exhibits are open there is a competing meeting or two, or three, or four, or there is the necessity of caring for luncheon engagements, dinner engagements, or other extra-program activity. Short snappy afternoon sessions, or no sessions at all on some afternoons, may ultimately come to the mutual advantage of the exhibitor and those who now do not see the exhibits, much to their real loss.

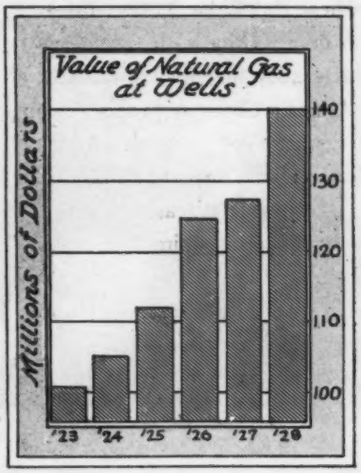
NATURAL GAS STATISTICS

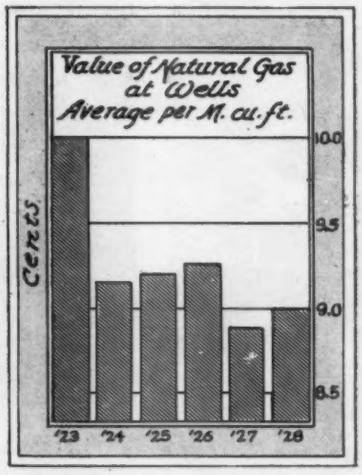


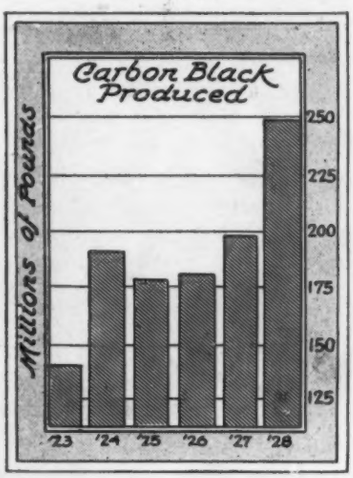
The accompanying graphs show a healthy growth in the Natural Gas Industry and help to visualize what this mighty thermal agency is doing both as regards making living conditions better as well as facilitating the advancement of industrial affairs.

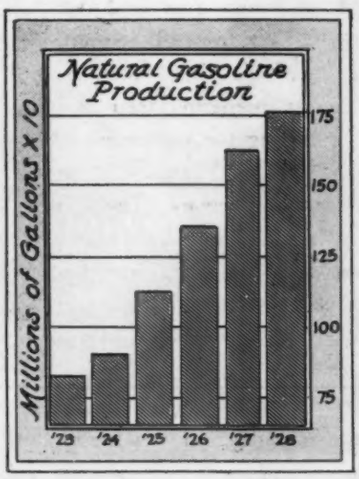
With this fuel already serving a number of large American communities and on the eve of being distributed in other cities of first rank there should obtain for the current year radical increases in customers and consumption.

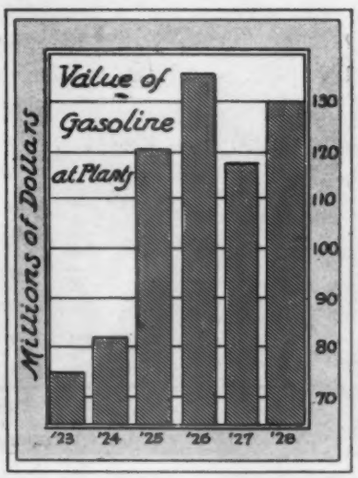


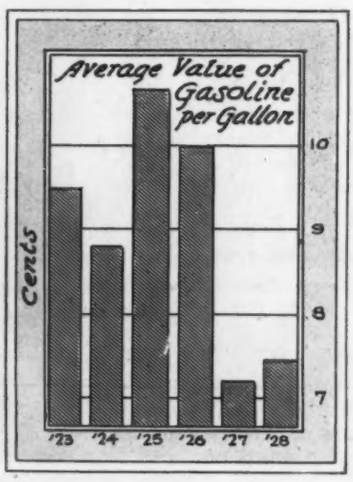












Basic data as well as estimates for 1928 from Bureau of Mines, U. S. Department of Commerce

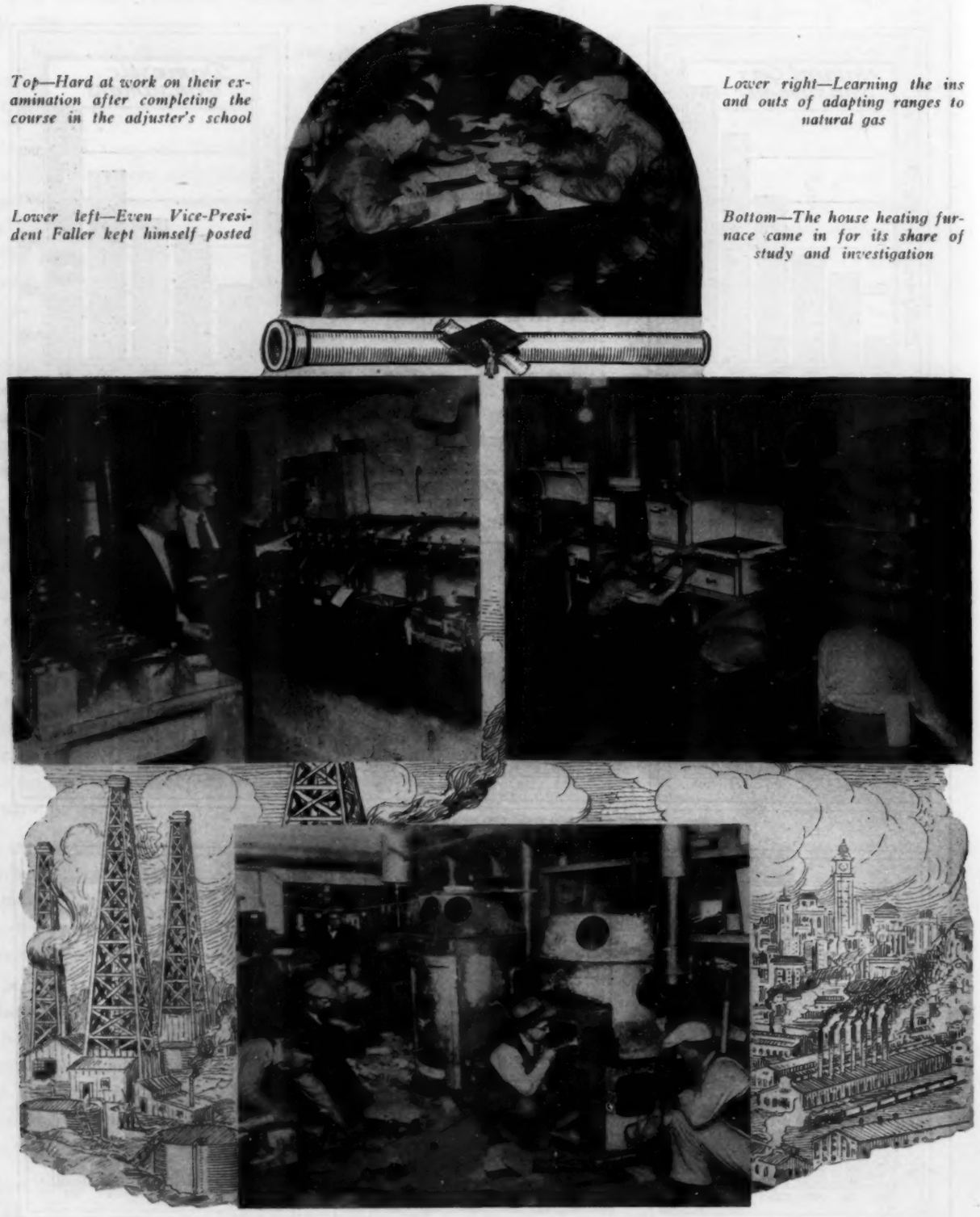
Denver sent them to school in order to facilitate the change to Natural Gas

Top—Hard at work on their examination after completing the course in the adjuster's school

Lower left—Even Vice-President Faller kept himself posted

Lower right—Learning the ins and outs of adapting ranges to natural gas

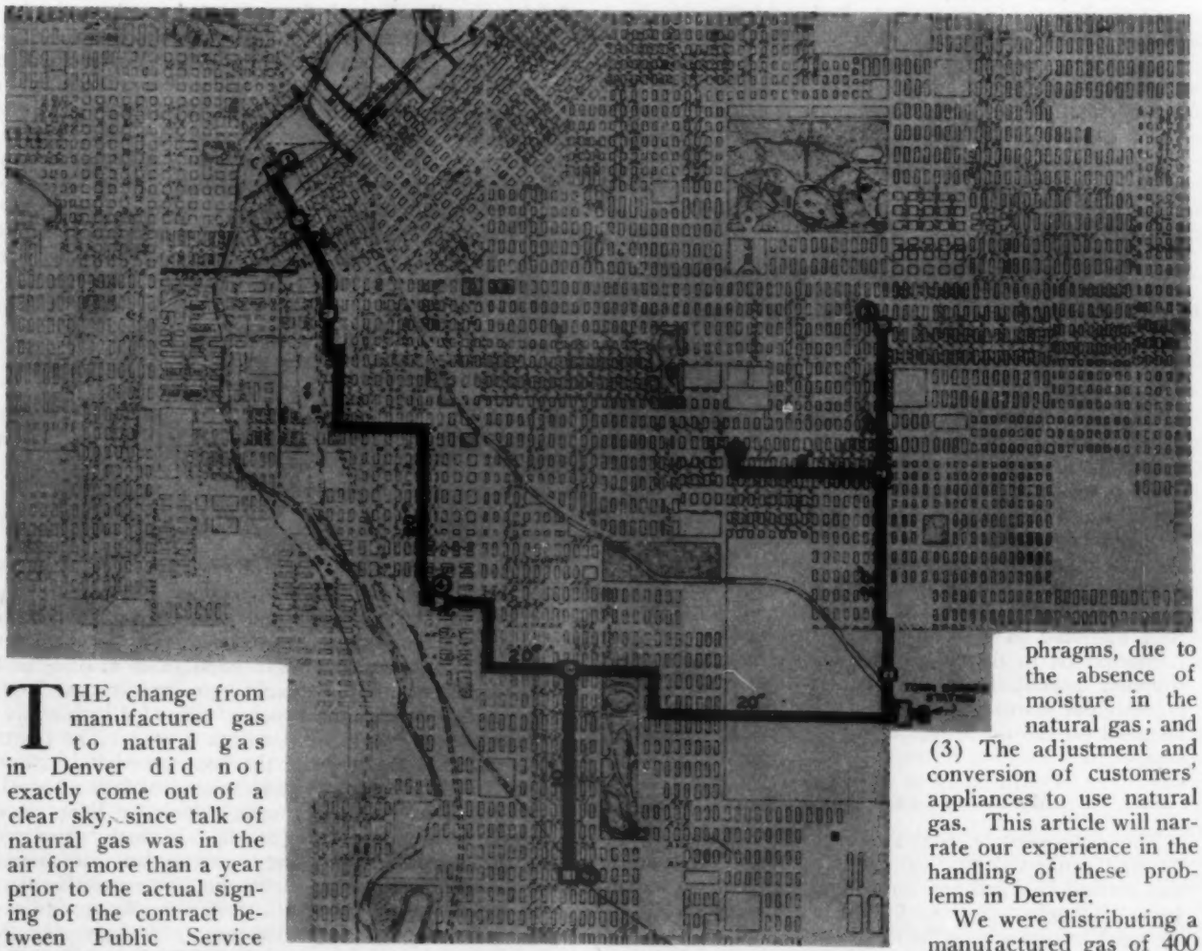
Bottom—The house heating furnace came in for its share of study and investigation



Some Problems Encountered When Denver Changed to Natural Gas

By George Wehrle

Superintendent, Gas Dept. Public Service Company of Colorado



Trunk line construction in Denver. Squares indicate valve vaults and circles regulator stations.

THE change from manufactured gas to natural gas in Denver did not exactly come out of a clear sky, since talk of natural gas was in the air for more than a year prior to the actual signing of the contract between Public Service Company of Colorado and Colorado Interstate Gas Company for supplying natural gas to Denver from the Amarillo, Texas, fields. We therefore had time for preparation and planning, and capitalized upon our experience in Fort Collins, Colorado, and Cheyenne, Wyoming, where natural gas from the Fort Collins' field was substituted for manufactured gas in 1925 and 1926.

We recognized that the substitution of natural gas for manufactured gas presented to us three major problems; namely, (1) Providing distribution facilities for distributing the large increase in volume of gas to be sold; (2) Overcoming excessive leakage, dust accumulations and drying out of meter and regulator diaphragms, due to the absence of moisture in the natural gas; and (3) The adjustment and conversion of customers' appliances to use natural gas. This article will narrate our experience in the handling of these problems in Denver.

We were distributing a manufactured gas of 400 B.t.u. per cubic foot, under standard conditions of temperature and pressure. The change from this gas to natural gas of a heating value of approximately 1040 B.t.u. immediately increased our distribution capability for the delivery of heat units 2.6 times.

Our distribution system is known as the Doherty Ideal System, in which is utilized higher distribution pressures and smaller supply mains than those commonly employed. Over 60 per cent of all mains in our distribution system are two inch in size, and the average size of all mains, including feeder and trunk mains, is approximately four inches in diameter.

Seven distribution stations are employed, which are

located in the various load centers of the system. Sufficient pressures are carried at these stations to maintain a constant utilization pressure of six inches water column (approximately 4 ounces) at the control point in each district. Pressures at the control point are indicated and recorded electrically at the district stations. Pressures at the district stations vary from two pounds to six ounces throughout the daily period, depending upon the load requirements as indicated by pressures at the control points. About 75 per cent of all services are individually regulated.

We had in use with manufactured gas some 400 househeating customers, most of whom were supplied from two inch mains, so that househeating was not entirely new to us, and we had already demonstrated over a period of six years that a considerable concentration of househeating customers could be adequately served through these two inch mains. Our first job was to take the gas from the town border station, or delivery point of the pipe line, to our district stations for distribution to the customers.

The town border station is located diagramatically opposite and seven miles distant from the former source of supply at the gas plant, which had supplied gas to the district holder stations. An intermediate pressure system was installed, linking up the gas works and various district stations to the town border station. The initial pressure on this system is 40 lbs., and this pressure is reduced to a maximum of 2 lbs. at the district stations. The holders have been kept filled for emergency, but have not been used since natural gas was turned on.

A 20 inch steel main carries the gas west from the town border station to the district station at the gas plant, where two regulators supplying different districts are installed. This line supplies two other district stations at intermediate points. A second 20 inch steel main runs north from the town border station for a distance of approximately two miles, to supply two district stations. Two other district stations were not connected on to the intermediate system, but are now supplied directly from the gas plant station, through the original transmission main. Our new station was installed on the north leg of the intermediate pressure system.

Mains Laid in Record Time

The intermediate mains were laid across town, through congested city streets, in record time. Work was started in April and natural gas was turned on in June. Trenchers and backfillers were used on all of the work except where the line ran through the railroad yards, where it was necessary to employ hand labor. The 20 inch pipe was welded together on the bank into 80 foot lengths and lowered into the trench with a crane, where a coupling was used to join to the pipe line.

We began to take on househeating customers before natural gas was turned on on June 23, 1928, and supplied 3200 through the past winter, which was the most severe experienced in Denver in thirty years. The degree days of the past winter was 10 per cent above the average for the past 57 years, yet no trouble of any kind was experienced from failure of the two inch distributors to perform. The peak day during the past winter was 16,500,000 cu. ft., and the peak hour was 1,500,000 cu. ft., which was 20 per cent more than had ever been sent out in like periods before. We estimate an additional 5,000 househeating customers will be supplied next winter, yet our budget for strengthening the distribution system this year is all for feeder main enlargements, with none for enlarging two inch supply mains.

As a load is being built up, it is necessary to plan a year ahead for the improvements needed, since pressure surveys must be made at times of peak demand in the winter for the benefit of the succeeding winter. Our method is to keep a large main map of the city, upon which all househeating customers are shown as dots. Different colored dots indicate the demand of the customers. Continuous pressure surveys are made throughout the winter upon the various feeder mains. When the data is all collected, the estimated number of additional househeating installations is projected as additional loads, proportionate to the loads already supplied by the various feeder mains, and the conductivity of the mains calculated from this estimated load. If the calculations show any of the mains to be overloaded, plans are drawn and the work of making the necessary improvement is done before the following winter. By this method capacity is always a jump ahead of the load, and so far no customers have suffered for lack of service while improvement was being planned. Our last winter's surveys in Denver showed a remarkable adherence to calculations made on estimated loads prior to the introduction of natural gas.

Counteracting the Effects of Distributing Dry Natural Gas

The problem of preventing serious effects when changing from saturated manufactured gas to dry natural gas is, in our estimation of considerable more concern than that of providing distribution capacity for the increased load.

When we turned dry natural gas in to Fort Collins and Cheyenne we made no provision for saturating the gas. The effects were anticipated, but were considered as something to be cured rather than prevented. Lost and unaccounted for gas began to increase at once and in Cheyenne where the mains were largely cast iron, with cast lead joints, the loss per mile of 3 inch equivalent increased 700 per cent within a year. The joints were then leak clamped and the loss immediately came down. In Fort Collins, where the mains were all steel, the loss increased 400 per cent, which we have since reduced by leakage survey work. In both cities we experienced trouble from dust accumulations, and found it necessary to change all meter diaphragms within two years after natural gas was introduced. As an indication of what might be expected in cast iron mains, with lead joints, when dry natural gas is used, in Cheyenne every joint uncovered leaked in a soap suds test, and when some of these joints were broken open and examined it was found that the jute packing was dry as tinder. We have had no trouble from the leak clamps and those examined recently, after two years' use, were perfectly tight.

In Denver we profited by our experience in the other towns and began at once to saturate the gas with both water and oil, which is introduced in the gas at the outlet of all regulator stations. While this sounds like a very simple process, a great deal of experimental work was necessary before we were satisfied that our applications were correct. We knew from our saturation curves that dry gas of a certain temperature would hold

so much water, and that when fully saturated with water a little oil could still be crowded into it. We felt that the oil would benefit our meter and regulator diaphragms, but were dependent upon the water for benefit in keeping the dust from forming and our cast lead joints from leaking.

Our first design of a water saturator was taken from our manufactured gas experience, being in the form of the ordinary wash box. A cylindrical vessel was made, into which a manifold pipe, with projecting nipples, was introduced. A water level regulator kept the nipples submerged, so that the gas was forced to bubble through the water and thereby become saturated. In a little while we found that we had an excellent iceless refrigerator on our hands, and the gas became so cold from the effect of the evaporating water that we were not getting saturation after it warmed up again in the mains. Our next step was to warm the water, but here again we met difficulty in a lack of temperature control to meet the varying flow of gas, which caused varying degrees of saturation and several times large quantities of water was carried out with excessively warm gas to deposit in mains and cause trouble. At the same time we found that during times of heavy gas flows a terrific vibration was set up in the apparatus, which threatened to shake the piping loose. We then went to steam and therein found our solution.

The steam is introduced into the gas stream at the outlet of the district regulator. A temperature regulator in the steam line maintains a constant temperature of the gas at the outlet of the saturating chamber, which is kept two degrees higher than the incoming gas at the inlet of the regulator. We find that this method maintains 90 per cent saturation in the gas at the extremities of the distribution system, where decreasing pressures have effected expansion to the maximum extent.

Handling the Oil Spray

The oil is introduced into a chamber made of 20 inch pipe, containing wood trays in the top section, by means of an oil burner spray, using dry natural gas at 5 lbs. pressure as the injecting medium. Experiments with gas at various pressures were made, and it was found that a more perfect oil fog was produced with 5 lbs. pressure than at any other pressure. The oil saturator is located directly following the water saturator. Ordinary gas oil of 34°-36° Beaume' is used, and a little less than one gallon per million cubic feet of gas treated, is all that will be absorbed; the balance, when an excess is used, deposits in the bottom of the saturator and is salvaged. While we do not pump anywhere nearly as much condensation from main drips as we formerly did with manufactured gas, we do get a little from each drip at regular intervals, which we feel is an indication that we have accomplished what we set out to do.

Natural gas was introduced in Denver last June, and after ten months we find no evidence of ill effects. Our lost and unaccounted for on a twelve months' basis per mile of 3 inch main is below 200,000 cu. ft. There is no evidence of the drying out of meter diaphragms; in fact, meters come into the shop with condensate from the manufactured gas still in the case. Examination of the mains shows no formation of dust and no leakage has been found in cast iron main joints examined. As far as we can see, conditions in our distribution system and meters are unchanged over the manufactured gas days in Denver. We believe that these conditions will maintain, and attribute the apparent success of our efforts to the fact that we began saturation immediately when natural gas was introduced. After the drying out process has proceeded to the point where trouble is experienced, it is our opinion that the saturation process is of no avail to remedy the ill effects already produced, although it may arrest the progression thereof.

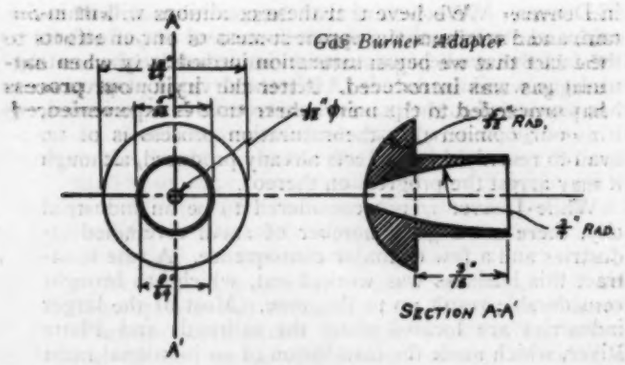
While Denver is not considered to be an industrial city, there are a great number of small diversified industries and a few of major consequence. A rate to attract this business was worked out, which has brought considerable result up to this time. Most of the larger industries are located along the railroads and Platte River, which made the installation of an industrial main to supply such customers with gas at intermediate pressures a rather simple one. A 20 inch steel main was installed to the north, connecting with the 20 inch intermediate pressure main near the gas plant station. The size of this line was continued at 20 inches to the point where a branch can be later taken off to supply gas to District Stations Nos. 5 and 6. It was then reduced to 10 inches for a distance of approximately one-half mile to supply a refractory plant. Further extensions of this line are now under contemplation.

Conversion and Adjustment of Customers' Appliances

Immediately following the passage of the natural gas ordinance by the Denver City Council, the Gas Department began planning its campaign for the change-over. Much of the work was pioneering in character, for never before in the history of the gas industry was there so drastic a change in thermal value of a gas sold to over 70,000 customers. The manufactured gas supplied had a thermal value of 400 B.t.u. per cubic foot, under standard conditions, while the natural gas was 1050 B.t.u. per cubic foot, under the same conditions. The physical characteristics of the two gases also varied widely. The manufactured gas had a high hydrogen content, the rate of flame propogation was high and the flame sharp, and with a tendency to backfire. The natural gas has a high methane content, a low rate of flame propogation, and the tendency of the flame is to blow off the burner parts rather than to backfire. The flame is very soft, as compared with the sharp flame of the manufactured gas. The manufactured gas required 3.5 cubic feet of air to complete combustion, while the natural gas requires 10 cubic feet. The above characteristics are significant and indicate that careful planning, and work was necessary in order to make the change-over a success.

It was deemed advisable to make a complete inspection of every customer's premises in the city in order that accurate information concerning appliances and various conditions of every installation be available before the change-over work began. It will be explained later how the discovery of an ingenious device would make a great part of this work unnecessary if we were doing it again.

In carrying on the inspection work, the city was divided into districts, each district in charge of a foreman, with a varying number of men. A house to house survey was made, and the information obtained was recorded on a specially designed card for each customer. Upon this card was listed name of customer, address, number, kind and condition of appliances, size and condition of service, regulator, meter and house-piping, etc.



From these cards the various orifices were ordered, and later assembled in envelopes, which were attached to the inspection cards to be distributed to the men when the change-over work began. It was found, as this work proceeded, that it was impossible to obtain orifices for certain old and obsolete types of appliances, and it was then that an adapter was designed which made the replacement of the orifices unnecessary, and which would make it unnecessary to have the detailed information regarding appliances that was obtained in our inspection. The adapter consists of a small brass plug, shaped somewhat like the eyelet of a shoe. The opening of the ordinary orifice plug is reamed to the size of a No. 20 Morse twist drill, the adapter inserted and expanded in this hole by the use of an anvil and mandrel so that a gas tight fit results. The opening in the adapter is No. 60 drill size, which can be reamed to suit conditions desired in adjustment. The openings in all orifice plugs ordered were of No. 60 drill size.

While the work of inspection and assembly of materials was in progress, the fitting shop force of normally about 80 men was being built up to the working strength required for the change-over of 350 men. It is realized what an important problem this presented, since it was necessary that these men be specialists when the work started on the customers' premises, and the job of securing and training some 270 men was no small task in itself. A training school was inaugurated and the men put through it as rapidly as they could be handled, in squads. The fact that this work was carried on in the summer, when students on vacation were available, was a considerable advantage.

The training of the novices consisted first in going out with an experienced fitter, or troubleman, for a few days, where some of the rough edges were knocked off and they became familiar with various fittings, tools and appliances. During this period various character tests were conducted, and if they passed through satisfactorily, they were then assigned to the school. All problems common to fitters and troublemen were presented in the school in such condensed form that in four weeks' time the men had obtained sufficient knowledge to qualify for the work in hand. Various types and kinds of appliances were connected up on the floor in such manner that the troubles normally experienced in the gas business could be simulated. Stuck and binding meters, trapped and stopped pipes and appliances out of adjustment were reproduced and turned over to the novice for correction. In order that the men in training might have an idea of the characteristics of natural gas, a synthetic natural gas, made by bubbling the ordinary manufactured gas through high test gasoline, was used. The resultant gas was 950 B.t.u. and had practically all of the characteristics of natural gas, except that the flame was sharper.

After the students had shown sufficient proficiency in the handling of the work, they were given a written examination, and after this were assigned to various useful work, such as changing burners in space heaters, etc. We found it necessary to change all of the burners in the radiant type space heaters, and as this could be done after the close of the heating season and prior to the turning on of the natural gas, it afforded an opportunity of using the men to advantage until the actual change-over began.

While the preliminary work of inspection and training of men was in progress, the Distribution Department was planning the sectionalization of the distribution system, so that natural gas could be turned into one section at a time, while others continued the use of manufactured gas, and arranging pipes for quickly purging the mains of manufactured gas after natural gas was turned in. To attempt the change-over of a city as large as Denver at one time would be an impossible task if the service to the customers were given any consideration. The city was divided into nine districts, which required 45 main cuts and five valve installations. The number of customers in a district varied from 3500 in the smallest to 12,500 in the largest.

When ready for the change-over the districts were divided into 20 precincts, with about the same number of customers in each. Each precinct was placed in charge of a foreman and twelve men, to whom were delivered the inspection cards and orifices corresponding. Gas was turned into the first district at 9:00 p.m. June 23, 1928, and into the last district on August 1, 1928. The time required to complete a district varied from three to six days, and forty actual working days were occupied in the complete change-over. Special crews were assigned to industrial and special installations, so that the men working on domestic installations worked continuously and rapidly. Special crews were also organized for the prompt handling of emergency complaints.

Work of the Publicity Department

Concurrently with the work of the Distribution and Utilization Departments was the work of the Publicity Department, which kept the customers intimately informed concerning the work, by means of newspaper advertising, radio announcements, etc. Three days prior to the turning on of natural gas in a district, cards of bright red color were mailed to each customer in the district. These cards gave the date gas would be turned on, and contained instructions for the customer to follow pending arrival of the adjuster. The customers were kept so well informed and became in such a state of "natural gas mindedness" that complaints and calls for emergency service were surprisingly small.

The Production Department also had a part in the program, for they had to schedule their operations as production was reduced so that efficiencies would not be impaired and ratios of coal gas to water gas were kept constant. This involved an interesting problem, but so well was the work carried out by these men, who were giving way to modern progress, that the last foot of manufactured gas left the plant holder just fourteen minutes ahead of the time scheduled for turning natural gas into the last district.

Reconstructing Cast Iron Mains For High Pressure Natural Gas

By W. A. Dunkley

Superintendent, Gas Department, Memphis Power and Light Co.

THE arrival of natural gas in Memphis, and the prospect of greatly increased volume of industrial gas business made possible by this fuel, necessitated careful consideration of ways and means to distribute the gas to industrial plants.

We already possessed a belt line of 16-inch and 12-inch cast iron bell and spigot pipe fifteen miles in circumference encircling part of the business and residential districts. Several large prospective customers were situated near to this belt line while others could be reached by spurs of various lengths supplied from it. We also possessed a cast iron line of 16-inch and 12-inch pipe of eight thousand feet in length connecting our center of distribution at our gas plant with our electric generating station which was to be converted to gas fuel.

The ultimate pressures which will have to be carried on the belt line were and are still problematical depending on growth of business and location of industrial plants to be supplied, but we could foresee an immediate maximum hourly demand at the electric plant of more than one million cubic feet per hour which, with the pressures necessary at the burners and for metering and regulation, would require an initial pressure on the line of 35 to 50 pounds per square inch.

This line consisting of 4,000 feet of 16-inch and 4,000 feet of 12-inch pipe traverses a small business and residential section and is almost entirely under asphalt and brick pavement. We were especially anxious, therefore, to adopt a joint packing which would be not only gas tight up to 50 pounds pressure but also give promise of long life. The joints in the 16-inch portion of the line were originally packed with cast lead and jute, while the 12-inch portion contained chiefly cement and jute joints with cast lead and jute joints at inter-sections. Upon uncovering joints it was found that the 16-inch lead joints which were a little more than ten years old, were, in general, leaking manufactured gas slightly under the then normal pressure of 10 inches of water. In the older 12-inch line, lead joints were also leaking somewhat but the cement joints were generally tight.

Drying Out Tendency

The experience as reported to us in other cities where a change had been made from manufactured to natural gas, was that after a few months, the natural gas which is usually very dry, will dry out the jute packing of joints and result in serious leakage, especially if higher pressures have to be carried to meet increasing load. It was therefore reasonable to expect that our experience would be similar. We determined, therefore, to forestall if possible this condition in our belt line leaving our low pressure net work for future treatment.

Two methods of treatment seemed open to us, namely to employ some form of leak clamp on each joint or to remake the joint using rubber as the gas retaining medium with suitable other packing to hold it in place. In deciding upon which method to use we sought advice from other gas companies who had been through similar experience and while some differences in opinion were expressed, we decided, in the main, to follow the latter method. Under some conditions the application of leak clamps seemed to possess advantages and several hundred of them were used.

Removing Old Packing

In remaking joints our first problem was to remove the old packing in the most expeditious manner. We soon discovered that the removal of lead and cement from joints by the use of hand tools was a laborious, time-consuming proposition, especially where several thousand joints had to be remade. Since the great majority of our joints were made up with cast lead, which we found more difficult than cement to remove by hand, we became interested in some mechanical device which would accomplish the work more rapidly and with less labor. A successful machine for cutting out lead joints in small sizes of pipe was on the market and its producers were sure that an air motor driven machine could be perfected which would accomplish the work. It was soon discovered that the adaptation of a machine of this nature to 16-inch and even to 12-inch pipe presented considerable difficulty

To do the work the machine must be sturdy, it must be light enough to be handled by one or two men, it must require but a reasonably short time tor adjustment to the work and, as was shortly discovered it must be adaptable to joints made up with the adjacent pipe lengths at a slight angle with each other. This latter condition we found very common, and while it might have been overcome had time permitted, we were unable to wait for the necessary experimental work to overcome this difficulty and had to turn to other means.

We had considered the practicability of burning or melting the lead out of joints by an oxy-acetylene torch but had hesitated about attempting it on account of a possible hazard. When slow progress by other means showed that the work would be unduly delayed, we again turned to the burning method as a solution and after studying the details decided that the method could be used with perfect safety if proper precautions were taken.

Our first thought was to isolate a section of main by inserting two bags at each end with a vent between each pair of bags, then purge the gas out of the isolated

section by compressed air until an Orsat apparatus should indicate by absence of CO_2 content, that no gas (carburetted water gas) was present. This method would involve tapping four or possibly six holes in the main and a rather precise analysis of the gas to prove with certainty that no explosive mixture was present. We then considered the alternative of burning out the joints with gas in the main and decided that this was the more practical method. We reasoned that so long as there was a positive gas pressure in the main, even ever so slight, there could be no explosive mixture. The only danger if any would be when the torch burned through the packing and ignited the gas, the pressure blowing the flame out against the operator. We decided to reduce this danger to a minimum by holding the pressure in the main very low but still positive. A pressure of 0.5 inch was found to be entirely safe. In many cases when the jute packing was well preserved in the joint, the gas did not ignite at all.

Isolating Section to Be Repaired

The section of main to be worked on about 400 ft. long was isolated by gas main stoppers. There was sufficient leakage past the stoppers to maintain a positive pressure and any excess pressure over 0.5 inch was controlled by a stop cock in a 2-inch bleeder pipe about 8 ft. long. An observer constantly watched a water gauge and controlled the pressure.

Protection of Lead Burners

We found that the joint burners were rather hesitant at first about undertaking the work, fearing that something might go wrong permitting a rush of gas which might burn them. To reassure them, a life line was placed around each operator and a helper stood ready to pull him out of the ditch should any accident occur. However, we were fortunate in that although several thousand joints were burned out, there was never any occasion to pull a man out of the ditch.

We did find it necessary to protect the operators from lead oxide fumes. This was accomplished by requiring each operator to wear face mask supplied with air by a portable forge blower through a light air hose. We found that for steady work one of these forge blowers was much to be preferred to the blowers ordinarily furnished with the masks, since they had greater capacity and being mounted on an iron pedestal at convenient height were much more easily operated.

For this work we found that a low pressure torch was most suitable. Our main object was to melt rather than burn the lead from the joint. The procedure followed by the operator was to begin at the bottom of the joint melting the lead up one side from bottom to top. The melted lead ran down over the heated pipe and collected in a sheet iron pan placed beneath the joint. One side of the joint being completed, the operator began at the bottom and worked up the other side. In this way a large part of the lead was salvaged. In some cases, where the jute had been in the joint many years and was partially disintegrated permitting gas to blow through at a particular spot, this was stopped by a little fresh jute rammed into the hole. On some sections of main the jute was in such generally poor condition that a temporary jute packing had to be made all around the joint to maintain the pressure without excessive waste of gas.

Cost of Burning Out Joints

The speed of removing lead by this method was greatly in excess of that attained with hand tools. By the latter method, the average time was about 2½ hours for two men on a 16-inch joint, whereas a good lead burner could burn out the lead from a joint in 15 to 20 minutes, though with inevitable losses of time a burner averaged about 2 joints per hour.

The following is an itemized cost of burning the lead out of a 16-inch joint:

Acetylene Gas per Joint	$0.277
Oxygen	.172
Burners wages @ 60c per hour	.310
Helpers @ 30c per hour	.155
Total	$ .914

Acetylene gas cost us $3.00 per 100 cu. ft., oxygen cost $1.30 per 100 cu. ft. We found that a tank of oxygen and a tank of gas of the usual sizes would suffice for approximately 27 joints.

Supplying Customers on Section Worked

While a section of main was being overhauled the customers off from it were supplied through a small temporary main carried along the curb. In this way, no customer's service was interrupted for more than a few minutes. The location of our plant and two holder stations on the belt line permitted three gangs to work simultaneously, one gang between each two stations, the station holders being filled at night. Toward the last, two gangs worked on one section, so arranging their work that one gang was doing preparatory and finishing work such as uncovering and backfilling during the A. M,. while the other gang was removing and replacing

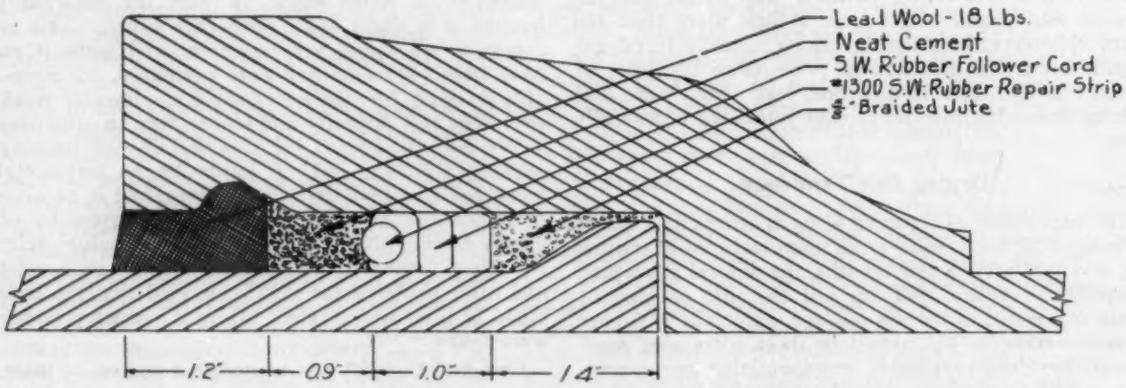


Fig. 1. 16" joint for natural gas, the Memphis Power & Light Co.

joint packing. In the P. M. the operations of the two gangs was reversed. In this way, service was continuously maintained to customers on the section of main between the gangs.

Remaking Joints

As stated previously, it was decided in the main to remake the joints rather than use leak clamps except under certain conditions. A variety of joint packing arrangements were suggested. Those used by us were the following, the material being placed in the joint in the order named:

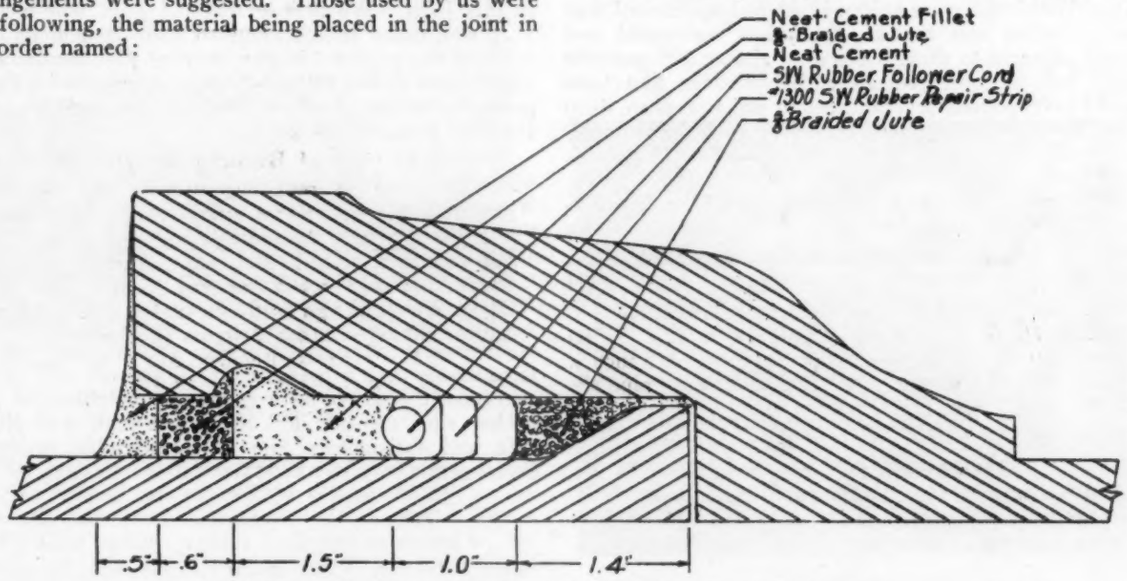


Fig. 2. 16" joint for natural gas, the Memphis Power & Light Co.

Joint 1 (a) Square braided jute, five-eighths diameter; (b) Channeled rubber strip, crescent shaped section wrapped three times around pipe and nested together; (c) Rubber follower strip of circular section nested into last lap of channel strip; (d) Neat cement; (e) One lap five-eighths square braided jute; and (f) Neat cement face.

Joint 2 Bottom jute and rubber as in Joint 1, then neat cement to bottom of lead groove, lead groove filled with lead wool, hand caulked and finished with pneumatic tools.

Fig. 1 shows typical section of Joint 1 made up in standard single groove 16-inch pipe. Fig. 2 shows section of Joint 2 in same kind of pipe.

Packing of Joints

The success of either of these joints depends largely upon workmanship, including proper cleaning of the joint before packing and proper preparation of the cement. Where lead has been removed from a joint by burning, the pipe must be thoroughly cooled and all lead which tends to stick to the pipe, carefully scraped off. The cement must be of best quality, freshly prepared and of the proper consistency, neither too dry nor too wet. If too dry, it will not cohere properly; if too wet, the cement will squeeze out of one part of the joint when rammed in elsewhere especially when tightly packed against the rubber packing which precedes it. In general, we have found the moisture content about right when the cement though appearing dry will retain the impression of the hand when a handful is squeezed. The cement used on the face of the joint after packing was wetter than that used in the joint and was smoothed with the hands, encased in rubber gloves.

The rubber packing strip, both crescent and round section was a special composition claimed by the manufacturer to swell upon absorption of hydro-carbons from the gas, and by filling all voids completely, make all small leaks self healing.

The lead wool must be of a good grade and very malleable. Lead containing impurities tending to decrease its malleability should be avoided.

Before making any joints as described above, in our distribution system, some test joints were made up at our plant where compressed air for testing was available. Workmen rather better than the average made up their joints but the pipe sections, being exposed above ground to the heat of the summer sun were very warm when joints were made. In spite of this, both types of joints were almost entirely tight when subjected to 50 pounds air pressure and tested with soap solution. Even at a maximum of 120 pounds the leakage was only slight, air bubbling rather than blowing out. This test led us to adopt the Joint No. 1, quite generally on account of its lower cost, until subsequently conditions arose which caused us to prefer Joint 2 for high pressure work.

The cost of these two kinds of joints in 16-inch standard bells is as follows:

	Joint 1	*Joint 2*
Jute packing	$ .24	$ .12
Rubber packing	1.38	1.38
Cement	.15	.05
Lead wool		2.02
Labor, etc.	.30	.40
Total	$ 2.07	$ 3.97

The line to our power plant, 8,000 ft. in length, was first overhauled and the No. 1 Joint used. We had no facilities for testing our joints at the time except with gas at 10 inches pressure, since gas at higher pressures was not available and the fact that more than 80 customers were served from the line precluded the use of compressed air for testing. All joints were tested with soap solution with 10 inches gas pressure in the main and any joints showing any leakage at all, were remade. We, therefore, felt reasonably certain that we had a

tight line. Eventually, when high pressure natural gas became available for testing, we were disappointed to discover that at pressures around 35 pounds the leakage was very heavy. Nine cracked pipe sections and several cracked bells, as well as some leaky valves between this and other parts of the system, and leaks around screw plugs in stopper holes, leaks which had not been indicated at all at the lower pressures, began to show up and had to be located and repaired. Even after these leaks were stopped, the leakage record was bad. During our repairs, the joints uncovered and tested adjacent to these leaks were almost 100 per cent tight, but we observed after the pressure had been raised to 35 pounds several times to make pressure drop tests, that the joints were beginning to leak, although practically no leakage was observed under 15 pounds pressure.

It appeared that our repeated testing of the line with variations in pressure had strained the joints, and we finally decided to overhaul again the entire 4,000 ft. of 16-inch pipe in this line. The 12-inch section was much tighter and we decided to leave that as it was. Before reaching this decision we tried to stop the leaks in several joints by the use of leak clamps, but found that we could not make the leak clamp rubbers seat snugly enough on this joint to stop the leakage.

Accordingly, the No. 1 joints were removed down to the rubber packing and the joints repacked with cement and lead wool, the joint designated above as No. 2. The line was tested in sections approximately 1,000 ft. long with natural gas at 50 pounds pressure. We were gratified to find that there were very few leaks and those small and repairable by caulking. The line has been in constant operation for two months since this repair was made, at 35 pounds pressure and no detectable leakage has developed.

Our rather unfortunate experience as outlined above, with the No. 1 joint has not entirely destroyed our faith in this joint. We believe that the joint will hold up very well under pressures up to 15 to 20 pounds especially if the pressure is steadily applied and not varied rapidly and through a considerable range, but for higher pressures up to 50 pounds we have more confidence in the No. 2 joint.

We are aware that there are gas distribution men who would not advise the use of bell and spigot cast iron pipe for gas pressures higher than a few pounds under any circumstances. Even with its greater durability and lower cost as compared with steel pipe in certain sections of the country, the writer would prefer welded steel to cast iron bell and spigot pipe for a new line which was expected to carry upwards of 25 pounds right from the start, but where an existing cast iron line is available and a pressure of 50 pounds will not be exceeded, the writer believes that the combination jute, rubber ring, cement, and lead wool joint will give a safe and satisfactory line at considerable saving in investment.

Recent Gas Production Figures for Chickasha Gas Field, Oklahoma, Check Original Estimates by Bureau of Mines Engineers

Recent figures on the gas production of the Chickasha gas field, Oklahoma, indicate with what degree of accuracy it is possible to estimate gas reserves if these estimates are based upon careful analyses of field conditions, says the United States Bureau of Mines, of the Department of Commerce.

In March, 1926, at the request of operators in the Chickasha gas field, Oklahoma, and in cooperation with the State of Oklahoma and the Oklahoma City Chamber of Commerce, the Bureau of Mines issued an engineering report on the Chickasha gas field, Grady County, Oklahoma, giving estimates of the recoverable reserves in that field. R. R. Brandenthaler and E. P. Campbell, engineers of the Bureau of Mines, were the co-authors of this report.

The two main producing zones in the Chickasha gas field are the Nicholas and the Ramsey. A previous report of the Bureau of Mines issued in May, 1923, discussed the Nicholas zone in some detail, but prior to the time of making the supplementary report in 1926 very few data were available on the deeper or Ramsey zone, which was believed to contain much larger gas reserves than the Nicholas.

The Bureau engineers in submitting their report stated "Past experience has shown that the method for determining gas reserves applicable to any field depends upon various factors. An intimate knowledge of field conditions, field methods, rock pressures, and amount of gas withdrawn (which would include fairly accurate estimates of the amount blown into the air) are necessary before any estimate of the recoverable reserves can be made."

Internal Corrosion of Natural-Gas Lines

Speaking before the Pacific Coast Gas Association, Malcolm T. Burton, of the Southern California Gas Company, drew the following important conclusions from experimental work and field observation in the Inglewood and Baldwin Hills oil fields and from work done in the laboratory of his company.

"1. Internal corrosion in the natural gas lines in the Inglewood oil field is caused by hydrogen sulphide in water solution and also by sulphuric acid formed from the hydrogen sulphide.

"2. High pressure, through the greater solubility and solution rate of gaseous oxygen in the corroding medium, under increased oxygen partial pressure, with consequent depolarization of iron, is the controlling factor.

"3. Corrosion increases generally in proportion to increased partial pressure of oxygen, with increasing total pressure. Corrosion rises to a maximum and falls off and remains fairly constant.

"4. Dehydration and purification are shown, through experimental evidence obtained as nearly as possible under actual working conditions, to practically eliminate corrosion.

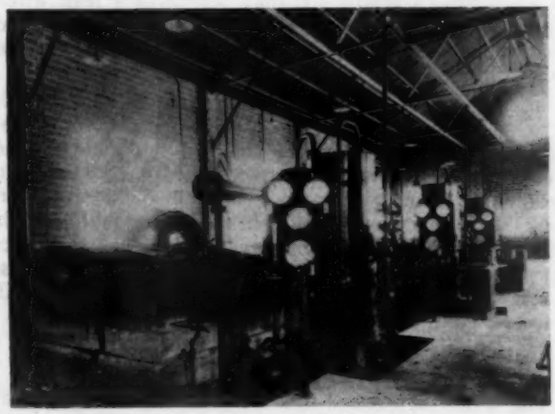
"5. Introduction of a light oil into the line in the form of a spray, has been shown through actual use to be of great value in retarding corrosion."

Extracting Helium from Natural Gas

U. S. Bureau of Mines builds and operates Plant at Amarillo

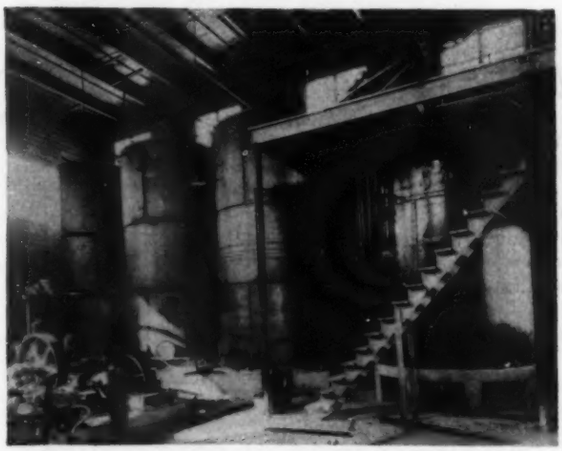
Works Office. Wash house and low-pressure gas-storage holders in rear-ground.

INCOMBUSTIBLE balloon and Zeppelin gas supply for United States airships is assured by the establishment and operation near Amarillo, Texas, of a helium recovery plant built and operated by the Bureau of Mines. This plant will process a large volume of gas daily by liquefaction of all constituents except the helium. The gas is being supplied under contract with the Amarillo Oil Company; and subsequent to processing the original gas, minus the helium, is again evaporated by allowing its temperature to return to normal so that it can be delivered into the lines of the Amarillo Oil Company for use in Amarillo city supply. The company now has three gas wells with a combined flow of 27,000,000 cubic feet per day available for the exclusive use of the plant.



Battery of three gas compressors to furnish high-pressure gas supply for the helium works.

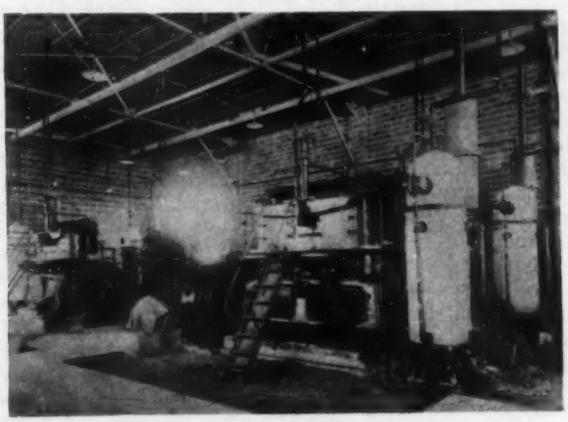
In the new Soncy plant, the helium will be recovered by cooling the gas to approximately 300 degrees Fahrenheit below zero, at which temperature all of the constituents of the gas, except the helium, are liquefied, permitting the helium to be drawn off as a gas and compressed into tank cars or steel cylinders for shipments to points where it will be used primarily in the Army and Navy lighter-than-air craft.



Carbon dioxide pressure washers for gas purification.

Before the United States entered the World War, helium had been obtained only in small amounts as a curiosity in scientific laboratories. The total quantity recovered probably did not exceed 100 cubic feet and the cost of production was about $2,000 per cubic foot. As a result of the investigative work of the Bureau of Mines, in cooperation with the Army, the Navy, the Linde Air Products Company and others, the cost of production of helium has now been brought down to but a few cents per cubic foot.

The heating value of the natural gas is improved by the extraction of the helium.



Gas-engine-driven electric generators which supply power to the helium plant.

Photos by courtesy Amarillo Globe News

What About Appliance Merchandising, Mr. Natural Gas Man?

By S. M. Apperson

The People's Light and Power Corporation of New York

AN auditor for a large holding company, operating principally artificial gas plants, recently admitted to the writer that he could understand why an artificial plant should merchandise, but he could not see why a natural gas company should.

"He could not see why a natural gas company should merchandise." Can you imagine that? We agree that, with high priced artificial gas, the sales resistance is greater and consumers consequently harder to sign. But, think of the small margin of profit the average natural gas company has between the wholesale and distribution price of natural gas.

The writer was with an artificial plant, when natural gas was turned into its mains and the business, both domestic and industrial, signed up during our first year amounted to an estimated increase of over 900 million cubic feet and we had a very good consumption before the advent of natural gas. Our peak load for one day had been estimated at 4,500,000 feet and on several occasions, we went over 7,000,000, and, *we did not make any money our first year.*

Active Merchandising—the Answer

What is the answer? Why, it can be nothing but active merchandising; building up the consumption per meter. Natural gas men should not be satisfied with a range and a possible water heater consumer. They must secure the entire house-heating, garbage-burning, laundry-drying, and every conceivable gas burning appliance business possible in the home of their consumers. Incidentally, people do not come into the office and ask for the last named appliances nor do they come in and ask for water heaters. You have to go out and tell them your story; tell it to them regularly and tell it to them intelligently. And this can only be accomplished by a well organized, intelligent and hard working merchandising department.

Another important angle to the merchandising activities of the utilities is that of controlling the type of appliance sold on our mains and, as we all know, the big factor in any public utility business is the building of good will. Without that, no utility can ever hope to succeed.

I have had the opportunity during the last few months to go into several towns on investigation work and it so happens that in the towns I have visited the gas company did not merchandise. There I found that the gas appliance dealers, as a whole, were selling an inferior product at an extremely high price, and they knew nothing of servicing the appliances they sold. Consequently, people who have bought appliances are more or less dissatisfied, for as we all know the average gas appliance needs servicing, as does the finest built automobile, for some little time after it is installed, or at least until the people understand its proper method of operation.

The cost of piping a house in these towns was almost prohibitive and right here I hold that a gas company should do every bit of the piping that is possible in a home. Consider the result of a gas company not merchandising or doing piping work.

I found that in one town with a population of 5500, practically all white and one of the wealthiest towns of its size that I have ever visited, there were only 460 meters. And yet there were 740 homes on this same system of mains that were not using gas. Why? There were no field men calling on them, telling them their story and offering good merchandise at legitimate prices and on a monthly payment plan, such as would enable anyone in a community to become a consumer of natural gas.

Relative to the piping of homes, I have found, regardless of city ordinances, that some jobs slip by the inspector. Then, who gets the blame if the pipe is too small for the load or if a leak develops? Is it the plumber who put in the job? Not at all; it is the gas company. You can overcome that by doing your own piping work and going the city ordinance one better by putting in oversize pipes to take care of the load increase that we are out fighting for all the time. We all know that a piping job may not show a leak when the city inspector tests it. But it can develop later and a consequence may be a $10,000 lawsuit. We should be sure that all of our jobs are tight.

Then too, when you sell gas appliances in your offices you have a greater opportunity to get your consumer into the place where you can sell them on the idea of gas, its wonderful convenience, its economy and cleanliness. You have your men in the field calling on them with the same story all the time, taking their "kicks," asking if they are satisfied consumers and making personal friends which means also company friends, for it is necessary for your salesmen to do that, if they are going to make a living.

Quotas for Salesmen

The writer has found that a salesman can easily take care of from 1000 to 1400 consumers according to how closely or thickly populated the community is that he is working. Over 1400, I don't believe can be called upon regularly enough and in the busy seasons the salesman can not take care of his estimates on piping and inquiries on appliances.

In the small towns, if several are close together, as

you usually find them in a natural gas territory, my idea is that after flush production or if natural gas has been in use for some months, one man can handle 1000 meters, with a district commercial man to every 5000. In medium size towns the figure is 1000 to 1500 per one man. From 1500 to 3000 requires one man in charge of his department who will work a territory and one salesman. Over 3000 there should be 2 salesmen and a man to handle the department, sales floor, advertising and add the needed punch at times to the other man to put over a sale. From this point the increase then is one man for every 1000 additional consumers.

When you reach 7000 consumers I have found that it is practical to have at least 5 domestic salesmen, a saleswoman in charge of the floor, (I believe that a woman of the right type is quite superior on her job than a man, since there is a great deal of detail work, such as taking care of salesmen's prospect cards, helping to build public interest, etc. In handling these duties I feel that she is better suited than the average man), a heating engineer for house heating alone, and finally, a commercial manager to take care of advertising, purchases and other administrative details. Incidentally, the heating engineer should be qualified to go into any type of home and give estimates on the probable yearly consumption besides advising as to the right kind of equipment to be used.

Value of Home Service Work

Of course, a Home Service department is a wonderful help, but my opinion is that you can not afford it under 20,000 meters. However, you can have a woman on your floor capable of giving advice over the phone, possibly making a few calls, and, when necessary, calling at the home during the slack seasons. Moreover, she can follow up on appliances that have been installed and if you happen to have the right type she might even attend the bridge parties in the afternoons and create a great amount of good will for your company, as the woman of the home is the one that the utilities must suit.

The right woman on the sales floor is a fine asset to a company. You can, of course, get very good Home Service helps from the American Gas Association and your salesmen and saleswomen should study them and be able to render assistance whenever called upon.

In any merchandising, whether you are selling shoes, clothing, hardware, farm implements, groceries, drugs or what not, it is impossible to pay too much attention to your sales floor or to your window display.

An attractive window is one of the greatest assets that any merchandising concern can have. It is your attractive window that brings the people into your store. I am a big believer in advertising of all types, but regardless of the type of advertising you are doing, if the people come down to your place of business they are going to look into your windows before entering your store. If your windows are not attractive, well kept and clean, the chances are good that they will not come into your store. But if they do come into your store, it is with the idea of the skeptic and they are going to have to be sold again on your merchandise, where the mere fact that they came to your store after reading your ad indicates that they had already been sold.

So change your windows frequently; make them attractive and, getting back to personal viewpoints, the writer believes that the window trims issued by the larger of the appliance companies to be pasted on your windows constitutes the greatest boon extant in advertising. Make your windows simplicity personified.

All of us have been into the larger cities and have noticed the show windows of the department stores, with their attractive backgrounds and the simplicity of the arrangement of the merchandise shown and have thought how attractive it was. Doubtless you have seen in the larger stores a 20 foot window with nothing in it but a pair of slippers, a pair of stockings or a pair of gloves. Of course, within their store they have a complete line and when you enter, they can show you anything that you might desire, but their windows are in great contrast to the average utility window where they try to advertise everything they have in stock.

You should pay just as much attention to the personnel of your sales force as you do to your windows and sales floor. Be sure that you employ only the highest type of man or woman, one that the public will feel the utmost confidence in. If your sales force can not gain the confidence of the public you can not hope for the company as a whole to have their confidence, because your merchandise department meets your consumers on a much more intimate basis than your office force, and in their own homes.

As regards newspaper advertising, we can not do too much of it in proportion to our sales. It is necessary, but newspaper advertising must be tied in with other types of advertising.

Our company has found that if you plan your campaign in advance, 3% of your estimated mercantile sales is an ample amount to be expended on all types of advertising. Two of the 3% should be devoted to your newspaper advertising, the balance to be expended on sign boards and so-called charitable advertising, such as church papers, school papers and aiding any service undertaking.

Allotment of Newspaper Space

I have found that on a two weeks' campaign of any one gas appliance, some 220 to 275 inches of newspaper advertising is sufficient, provided that advertising is planned ahead and not run haphazardly. I believe in a special campaign, if advertised in the newspaper, on some appliances. I believe that the first two weeks of the month is the most satisfactory time to put on a campaign. I have found that during the third week of the month it is possible to cut out your advertising, but your salesmen can still close quite a few prospects and the writer has allowed them to do so on sales terms.

There is no such thing as seasonal sale of gas appliances. Any gas appliance can be sold at any time of the year if the quality is right, the price is legitimate and a concentrated "planned ahead" effort is put forth. Space heaters can be sold almost as easily in the summer months of the south, north, east or west, as in the winter months. Your house heating equipment, at least 90% should be sold and installed before the first of October.

If the larger of your bills, which is a case in the small communities, are mailed out on the first of the month, then by all means use envelope stuffers to advertise your campaign, which should start the first Monday of the month. At all times, regardless of whether your bills are mailed out or delivered, some type of advertising matter should accompany them. In other words, deliver your message to the home in as many different ways and as often as possible.

Billboard advertising is effective just so long as you have an attractive picture, just so long as your wording on the board is short and snappy and just so long as you have a prominent location. Where you tie the three together we have found it to be very effective, but you must have the unusual in your picture.

A natural gas company should at all times tie in and help promote food shows, fairs and in any display that tends to the making of better homes, better educating the people and the care of their homes and at any event that can help teach the great convenience, cleanliness and economy of natural gas.

For the present the writer is in a territory served entirely with artificial gas. The towns that he is campaigning have an average rate of $2.25 per 1000 and the electric rate for cooking will average 4½ cents per kwh. Yet he has found that at that rate, artificial gas is the most economical, regardless of what the engineer may prove on paper, and that the people prefer using gas. But the following condition has been found: The electric people are more actively merchandising and are telling their story more often and in a bigger way to the public, and the average gas man is developing an inferiority complex. But we have been allowed to overcome that and are overcoming it right along and we are going to show results that I believe will make the whole gas industry realize that there is nothing to be feared from electric competition.

I have found this same condition down in the territory of the low priced natural gas and it is going to be that way until the natural gas companies, all of them, start advertising, merchandising, getting together and employing a concentrated effort such as you will find among the power companies over the United States.

If you all have been in the artificial gas game, the natural gas game and the electric game such as the writer has been, you will find that for cleanliness, economy, satisfaction, fun of the game and the pleasure you can get out of your work there is nothing that can equal the natural gas industry.

Accessibility as a Money Saver

The invention of "Open Door" machinery was a long step towards the capitalization of time and effort. It is a "stop-loss," an eliminator of bolts, nuts, and labor; a convenience and a profit maker. Once tried, it is a hardship and an expense to do without it.

The heavier the machine and the larger the equipment, the greater is the importance of accessibility, because the time lost in reaching the inwards and the reversal of the operation is a loss that can never be regained. Production ceases during the interim; productive men are idle; the unproductive repair gang busy—one set of men loaf and the second set of men with hoisting and prying appliances, with tools and accessories and bull strength is needed to reach almost inaccessible parts. Surely an unnecessary expense and a most unprofitable task.

A door, weighing from a few pounds to many tons, swinging on hinges, does in a moment that work which otherwise would require the services of many men, consuming many valuable hours.

Such a convenience is now available for most machines, including Crushers, Pulverizers, Separators, Mixers, Elevators, etc. Now is the time to eliminate waste. What is greater waste than unproductive and unnecessary labor, and the consequent loss of output?

—Sturtevant Mill Co.

Convention Hall, Kansas City, Mo., where Natural Gas Convention will be held

A Manual of Dry Box Purification

By Gilbert E. Seil, H. A. Heiligman and T. H. Clark

E. J. Lavino and Company, Philadelphia, Pa.

Part I—Selection of the Purifying Material

IN most discussions on dry box purification of city gases, certain terms are used to describe various properties of the purifying material and to designate the various phases of the reactions which take place. These terms are often used loosely and convey to the listener an idea altogether foreign to the mind of the speaker. The following treatise of necessity makes use of these terms, and at the outset, we shall define and explain each of them as it is used in this paper.

Capacity

A distinction must be made between the *theoretical capacity* and the *actual capacity* of a gas purfying material. One of the fundamental chemical reactions in dry box purification is that between ferric oxide and hydrogen sulphide.

$$Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O + Heat$$

This chemical equation means that 159.68 pounds of active ferric oxide will remove 102.06 pounds of hydrogen sulphide, or that 1 pound of active ferric oxide will fix slightly more than 0.64 pound of hydrogen sulphide in one fouling. In four foulings 1 pound of active ferric oxide will fix approximately 2.5 pounds of hydrogen sulphide, and this figure is the theoretical capacity of ferric oxide, 100% active. The capacity of any gas purifying material naturally depends on the amount of active ferric oxide which it contains.

The theoretical capacity defined above is determined in the laboratory by passing hydrogen sulphide in high concentration through the gas purifying material, until that material is saturated. The actual capacity of a purifying material is very much greater, because in practice conditions are vastly different. In the box we have a gas containing hydrogen sulphide in low concentration, and a regulated amount of added air passing through the purifying material. A second exothormic reaction which takes place is now considered:

$$2H_2S + O_2 = 2H_2O + 2S + Heat$$

This reaction means that oxygen in the gas, in the presence of ferric sulphide as a catalyst changes some of the hydrogen sulphide to water, sulphur and energy in the form of heat, and in the light of this reaction it is apparent that the material has a practical capacity much greater than the theoretical capacity.

Practice has shown that the oxygen content of the gas must be at least 0.4% and that the active iron oxide must be 15% fouled, before advantage can be taken of this reaction. Under these conditions, each one-tenth of one percent of oxygen above the critical point of 0.4% reacts with approximately 125 grains of H_2S per hundred cubic feet of gas. Analyses of samples of gas from hundreds of boxes have shown that when the oxygen content of the entering gas is less than 0.4%, or is exactly 0.4%, the oxygen content of the gas leaving the box is the same as that of the gas entering the box. But when the oxygen content of the entering gas is above 0.4%, the oxygen content of the gas leaving the box is still 0.4%, unless the percentage of oxygen in the entering gas is in excess of the amount which can react with the H_2S in the gas. In no normal case does a gas leaving a partially fouled box contain more than 0.4% of oxygen. The oxygen in excess of 0.4%, in the presence of ferric sulphide as a catalyst reacts with the H_2S and removes it from the gas. If a gas containing 400 grains of H_2S and 0.6% of oxygen is passed through the box, after the box has been partially fouled the oxygen reacts with 250 grains of H_2S catalytically leaving only 150 grains for the sponge to absorb. Thus there are two terms to define:

1. *Theoretical Capacity*: The theoretical capacity is the amount of H_2S a gas purifying material removes from a gas containing H_2S in the absence of oxygen. The theoretical capacity may be indicated as a percentage removal of H_2S, using the original weight of the oxide as the base, or it may be indicated as the quantity of H_2S removed per unit of material.

2. *Actual Capacity*: The actual capacity is the amount of H_2S a gas purifying material removes from a gas under conditions similar to those obtained in practice, where the gas contains H_2S in low concentrations in the presence of small amounts of oxygen beyond the critical point of 0.4%. This value, which is

The purification of city gas by the dry box method is generally considered, even by some men in the gas industry, a simple operation by which the hydrogen sulphide is removed from the gas by means of iron oxide. In reality there are many factors which enter into the purification of gases and which play important roles in efficient and economical operation.

Chief among these factors are: 1. Selection of the oxide; 2. Manufacture of the sponge; 3. Packing of the boxes; 4. General plant practice.

The authors have been in close touch with the gas industry for a considerable time and in the course of their experience have met with many of the problems which confront the purification engineer. In this manual they shall attempt to summarize the conclusions which were formed after a long period of intensive research in their company's laboratories and in gas plants.—Editor.

indicated in the same terms as the theoretical capacity, will vary with plant conditions. Under "Methods of Evaluation" the methods for determining both the theoretical capacity and the actual capacity of gas purifying materials are described.

Activity

In every chemical reaction the time element is a very important factor, and this is especially true in the absorption of H_2S by ferric oxide. If the ferric oxide reacts very slowly with the H_2S, some of the hydrogen sulphide will go through unabsorbed, not because the ferric oxide is unable to absorb it, but because there is not sufficient time for this reaction to take place. The ability of a gas purifying material to remove the last traces of H_2S depends on its activity, and if a comparatively inactive material is used traces of H_2S are not removed unless the box capacity is excessively large. With an active oxide, much smaller box capacities are necessary.

Some indication of the activity of a gas purifying material is obtained by the heat evolved when a small quantity of the material is treated with H_2S. It is of interest to note at this point that at one time attempts were made to evaluate the activity of gas purifying materials by the rise in temperature during fouling. However, the results were merely indicative of relative activities, and because the factors affecting this reaction could not be controlled, the results were variable and inaccurate.

The activity of a gas purifying material is the rate at which the material absorbs H_2S. This activity can be expressed as the length of time a definite weight of the material will completely remove H_2S from gas under certain definite conditions, which are carefully defined later.

The activity is measured by the rate at which an oxide causes H_2S to be removed from the gaseous phase. This removal may be affected by direct absorption of H_2S by the Fe_2O_3 or may be affected by the catalytic action of Fe_2S_3, causing the H_2S to react directly with the oxygen in the gas. There may be some question as to whether a catalytic oxidation of H_2S really takes place. It may be contended that what really happens is partial revivification of the fouled oxide, and that two reactions are really taking place side by side.

$$1—2Fe_2O_3 + 6H_2S = 2Fe_2S_3 + 6H_2O + \text{Heat}$$
$$2—2Fe_2S_3 + 3O_2 = 2Fe_2O_3 + 6S + \text{Heat}$$

Taking an algebraic sum of reactions No. 1 and No. 2, reaction No. 3 is obtained, and regardless of whether the reaction is cyclic as explained above, or catalytic as explained on page 39, the final results are quantitatively the same.

$$3—6H_2S + 3O_2 = 6H_2O + 6S + \text{Heat}$$

Under "Methods of Evaluation" a method for determining the activity of a gas purifying material under definite conditions and a system of recording the results obtained are described.

Evaluation of Gas Purifying Materials

Although gas purifying materials are usually evaluated on their respective percentages of ferric oxide (Fe_2O_3) usage has shown that this is not a true criterion of the value of the purifying material. Some materials containing high percentages of ferric oxide absorb no H_2S and therefore have neither capacity nor activity. Other materials which likewise contain high percentages of ferric oxide have a large absorption power for H_2S but their rate of absorption is slow. Still other purifying materials with comparatively low ferric oxide content have large absorption powers, and also have a rapid rate of absorption. Therefore the evaluation of a gas purifying material entails the accurate determination of its practical capacity and its activity.

The regularly used method of determining the capacity of a gas purifying material consists of passing H_2S in high concentration through a definite weight of the material, and noting the increase in weight. This method is described in detail in the "Gas Chemists Handbook," and gives results indicative of the theoretical capacity of the materials tested. However, this method does not evaluate the catalytic oxidation which takes place in the box in the presence of relatively small percentages of oxygen, nor does it indicate measureably the rate of absorption. This rate is as important as the capacity, in that it determines the power of the oxide to remove traces of H_2S.

After careful study and investigation the Technical Department of E. J. Lavino & Company has developed a series of tests which yield accurate figures indicative of the properties of a gas purifying material. A picture of the apparatus, and a detailed description of the procedure employed to determine these figures follows.

Methods of Evaluation

When the test is to be run in the laboratory, illuminating gas enters the apparatus at point "A" and is circulated successively through the fouling bottle "E" and the fouling tubes "K," containing the sponge, by means of the small compressor "C." In the fouling bottle, the gas bubbles through a mixture of a solution of sodium bicarbonate and a solution of sodium sulphide, which react to liberate H_2S. During its passage the gas reaches its equilibrium with the solution and on leaving the bottle contains a percentage of H_2S which is regulated by the strengths of the solutions. In the tests which have been made the equilibrium has been set at 4 grains of H_2S per cubic foot of gas.

Since it is necessary to know the temperature of the gas leaving each tube, to be able to take a sample of gas leaving each tube, and to conduct the gas either to the next tube or to a meter, each tube is equipped with a three hole stopper containing a thermometer "N," a sampling tube "M," and an exit tube "G." Each exit tube is connected to a drip bottle "H," which removes the excess moisture from the gas and prevents a pulsating flow through the apparatus.

After leaving the last tube the gas is passed through a recording meter, and then through a flow meter. Two meters are necessary, one to indicate the total amount of gas passed, and one to indicate the rate of flow. In using this apparatus a constant uniform gas flow must be maintained. To maintain this flow an indicating flow meter is placed in the gas line and is preceded by a wet gas meter which records the total volume of gas passed. Since these meters are in series, it is possible to calibrate the flow meter against the wet meter while running a test. The residual gas may be burned, allowed to escape into the atmosphere, or may be recirculated.

When the effect of added oxygen is to be studied, the addition may be regulated by means of the constant pressure bottle "V." Water is run into a constant level tube "S," entering at "T" and overflowing through

the tube "U." The difference in water level between "S" and "V" forces the air through the meter "W" and into the apparatus through the regulating cock "Z." As the amount of air added is very small a bubbling bottle "Y" is put into the system and the amount of air can be regulated by noting the number of bubbles per minute through the bottle "V." While the test is under way, analyses for H_2S and oxygen are made at "F" and "M."

Preparation of the Sample

Sawdust is prepared for this test by screening so that it passes a 20 mesh and remains on a 40 mesh screen. Very coarse sawdust should not be used, because the sawdust is to bear the same relation to the fouling tubes as the shavings to the box. One hundred twenty grams of a representative sample of the material "as received" are made into a sponge by mixing with 60 grams of sawdust and sufficient water, so the mixture contains between 45% and 50% moisture. In case the material is high in Fe_2O_3, a larger amount of sawdust can be used, to obtain a better distribution of the iron oxide. The mixing is carefully done in a large mortar with a pestle.

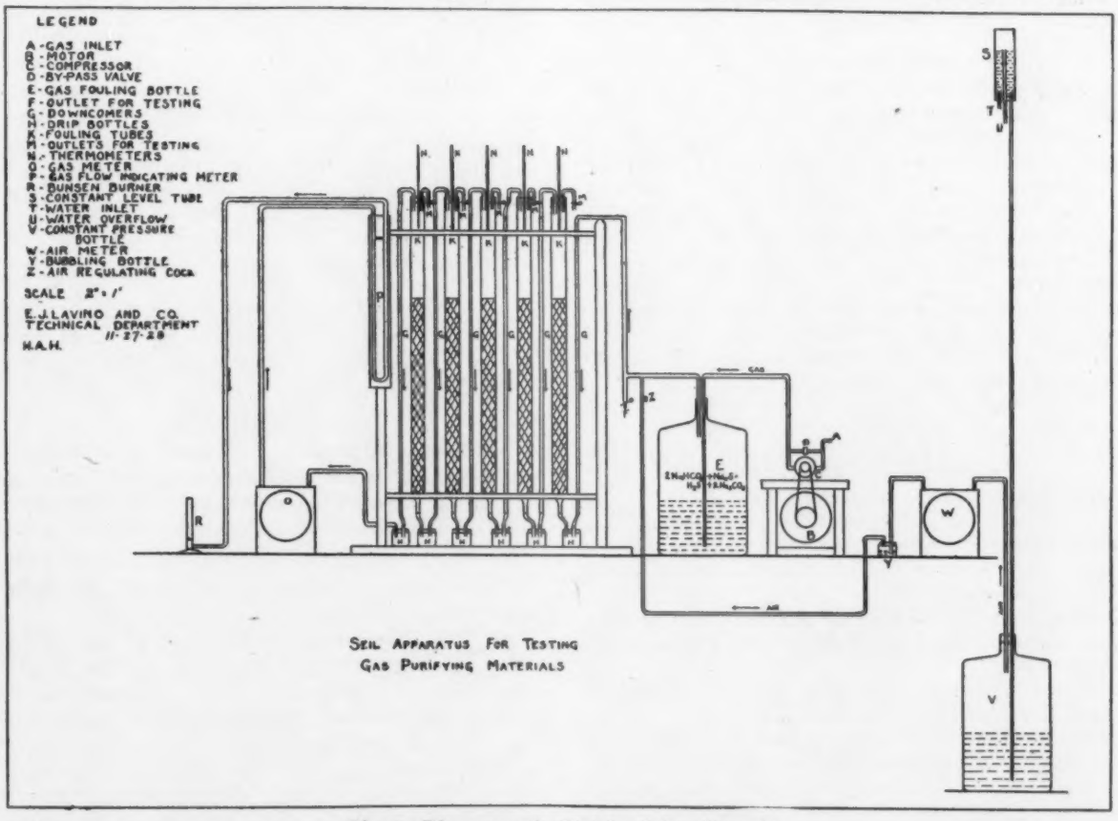
In preparing the fouling tubes, a layer of cotton is placed in the bottom to distribute the gas, and the charge is added in small quantities, each of which is packed before the next is added by ramming it in place using an inverted single hole stopper attached to a long glass rod. By this method of preparation, the difficulties of channeling are sufficiently eliminated. By adding the full charge at once, the effect of channeling can be very nicely demonstrated.

Procedure

In outlining the method of procedure, the determination of theoretical activity, and theoretical capacity is first considered because these values depend only on the gas purifying material tested.

After the apparatus has been set up as described, and the gas turned on, the blower is started, and the rate of flow of gas through the apparatus is regulated by the by-pass valve "D" so that the flow meter indicates 9 cu. ft. of gas per hour. To insure uniform results it is necessary to keep the H_2S content of the fouled gas very close to 400 grains per 100 cu. ft., and to regulate the flow so that 36 grains of H_2S enter the first tube each hour. A record is kept showing the starting time, and the percentage of H_2S and oxygen in the gas entering and leaving the tube. When a lead acetate paper, held at the sample outlet of the first tube for one minute shows a black stain, the time is again recorded. The time elapsed is a direct measure of the *theoretical activity* of the material.

The test is continued, hourly analyses being made of the gas entering and leaving the tubes. When the first tube no longer removes any H_2S from the gas, the *theoretical capacity* of the material has been reached,



SEIL APPARATUS FOR TESTING GAS PURIFYING MATERIALS

Fig. 1—Diagrammatic Sketch of the Apparatus

Description of the apparatus: Materials needed—one¼ H. P. motor; one small compressor (the compressor used in these tests is a No. 1 Vernon Air-Pump, made by the Lee S. Smith & Son Mfg. Co., and purchased from the Fisher Scientific Co., Pittsburgh, Pa.); two 5 gallon water bottles; five fouling tubes, 63" x 1½" outside, diameter—tapered to ¼" at one end; five small bottles for collecting drips; one U gage; two gas meters; one Bunsen burner (optional); five thermometers; one Tutweiler burette; one Orsat Gas Analysis Apparatus; necessary glass tubing, rubber tubing, stoppers, clamps, etc.

and this time is also recorded. The length of time required to saturate the material with H_2S is a direct measure of its theoretical capacity. It is optional at this point to revivify in place by passing a stream of air through the tube at a definite rate, and then to sample the revivified material, or to remove the fouled material from the tube, sample it, and allow it to revivify in the air. The authors prefer the latter method, because the sulphur formed during revivification in place cements the material so solidly in the tube that its removal is almost impossible. This sample is analyzed to determine the ratio of Fe_2O_3 to H_2S, from which the percentage fouling is calculated. After the material has been revivified it is replaced in the tube and subjected to a second fouling. This procedure of fouling, revivifying and sampling is repeated until the desired number of foulings have been made. The analysis of these samples, by the method described later, will give the theoretical capacity of the gas purifying material.

To determine the *actual activity* and *actual capacity* of a gas purifying material under certain conditions, the conditions are duplicated during the test. There is a choice of two methods, the apparatus may be set up where the foul gas from the plant can be passed at a definite rate, or a synthetic mixture may be made which will have the H_2S and oxygen content of the gas under consideration. The apparatus and the procedure for determining the actual activity and the actual capacity is the same as for the determination of the theoretical values.

Necessary Analytical Data

1. Hourly determination of the H_2S and the oxygen in the gas entering the first tube.
2. Periodic determinations of the H_2S and oxygen content in the gas leaving each tube after the development of a spot on the lead acetate paper.
3. Determination of the ratio of Fe_2O_3 to total S, calculated as H_2S, in the material after each fouling.
4. Determination of the Fe_2O_3 in the original purifying material.

In addition to the analytical data required, there are several other necessary observations.

1. Rate of flow of gas through the apparatus.
2. Total volume of gas passed.
3. Time required for the development of a black stain on the lead acetate paper at the outlet of each tube.

Method of Obtaining Data

H_2S is determined by the method outlined in the Gas Chemists Handbook using the Tutweiler burette and standard Tutweiler iodine.

Oxygen is determined by the standard method, using an Orsat apparatus.

The Fe_2O_3 to H_2S ratio is determined by treating the samples taken for the percentage fouling in the following manner:

A portion of two or three grams, which need not be weighed, is digested in 100 c.c. of 10% NaOH solution and 100 cc. of a 15% solution of sodium hypochlorite, and the solution is boiled until all the sulphur is oxidized to sulphate. This solution is then acidified by *pouring into* 100 cc. of HCl and it is boiled until all the iron is in solution. The solution is diluted to 500 cc., and cooled to room temperature. It is filtered through a dry funnel and dry paper into a dry beaker and two equal portions are pipetted from the filtrate, one of which is used for the determination of sulphur, the other for the determination of ferric oxide.

The portion to be analyzed for sulphur is evaporated to dryness on the water bath. The dry mass is taken up in 5 cc. of HCl and 100 cc. of water, the solution is boiled for a few minutes, and filtered. The clear solution is heated to boiling, 50 cc. of 10% $BaCl_2$ solution are added, and it is allowed to simmer on the hot plate until the barium sulphate settles. The solution is allowed to cool and is filtered, and the $BaSO_4$ is determined in the usual manner and calculated to H_2S.

To the portion to be analyzed for ferric oxide, 25 cc. of H_2SO_4 are added, and the solution evaporated to fumes. Any organic matter in the solution will cause a coloration at this point, and nitric acid is added drop by drop, allowing the solution to go to SO_3 fumes after each addition, until the organic matter is completely oxidized, and a colorless solution remains. The solution is cooled, diluted with 250 cc. of water, and boiled until all the ferric sulphate is in solution. Ferric hydroxide is precipitated by pouring the solution into a slight excess of ammonia and boiling for several minutes. The ferric hydroxide is filtered, washed with hot water, and the precipitate and the paper are dropped into a 300 cc. Erlenmeyer flask, containing 50 cc. of 1 to 8 HCl. The flask is heated slightly until all the iron is dissolved. It is placed in a hot water bath (40°C) and allowed to stand until it has reached the temperature of the bath. Five cc. of 40% KI solution are added, the flask is tightly stoppered and shapen, and allowed to stand in the hot water bath for 30 minutes. It is removed from the bath, cooled, the sides of the flask are washed down with cold water, and the liberated iodine is titrated with a N/10 solution of sodium thiosulphate, using starch as an indicator. The sodium thiosulphate is standardized against pure iron wire or any other material of known iron content. The iron can of course be determined by any standard method, at the preference of the operator.

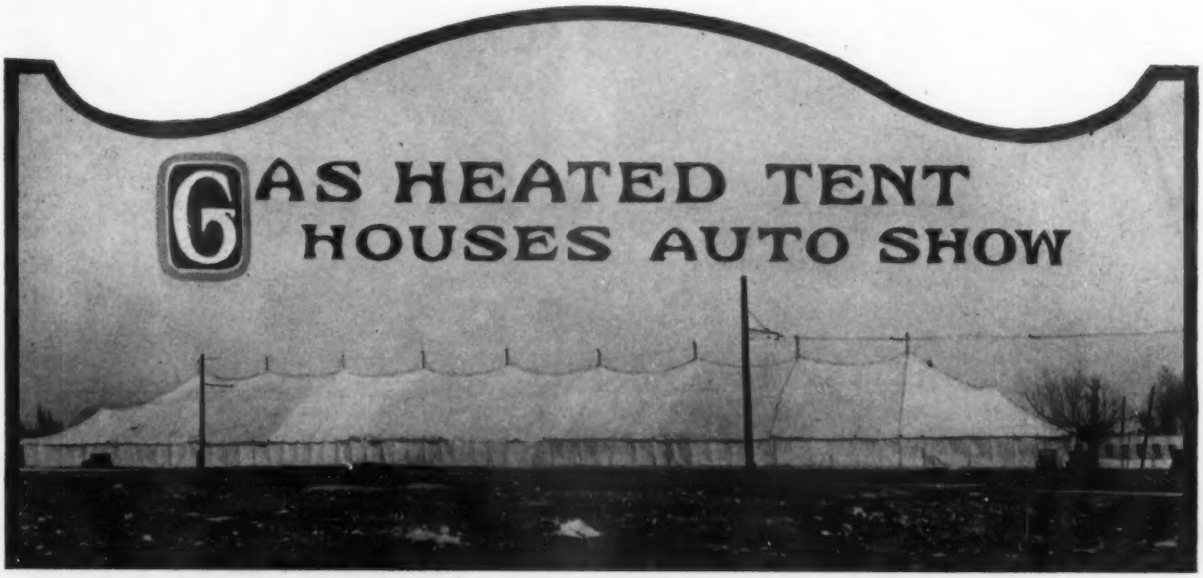
Percentage Fouling

The ferric oxide, and the H_2S have been determined in aliquot portions and the ratio of Fe_2O_3 to H_2S is calculated. This ratio multiplied by the percentage of ferric oxide in the original material from which the sponge was made, is the percentage fouling.

It will be noted that the foulings are constantly adding up, that is, the second percentage fouling is really the sum of the first and second foulings, the third percentage fouling is the sum of the three foulings, etc.

This same method of analysis can be applied to all sponges, fouled or unfouled, provided the percentage of ferric oxide in the original material is known. The percentage of gas purifying material mixed with shavings in manufacturing the sponge can also be determined by this method, determining the iron oxide in the original material, and the iron oxide in the finished sponge. In this case it is necessary of course to take a dried and weighed sample of sponge for analysis.

In the concluding portion of this article which will appear in the June issue of the American Gas Journal, the authors will discuss The Manufacture of Sponge, Method of Packing a Box and General Plant Practice. Interesting curves and other data will also be included.



Reported the largest tent ever erected in Utah, 100 feet by 420 feet, with 14-foot side wall and 34-foot height, to the peak, heated to 63° with out-door temperatures averaging 35°, with snow and stiff winds to add complications

By L. D. Simmons,

Advertising Manager. Utah Gas & Coke Company.

GAS heating made possible the comfortable housing of the Intermountain Automobile Show during February, despite out-door temperature as low as 12°F. This heating achievement of the Utah Gas and Coke Company has made many friends for gas in Salt Lake City and has again demonstrated that modern gas appliances can, with a little ingenuity, do almost any heating job effectively and efficiently.

Approximately 880,000 cu. ft. of space in the largest tent ever erected in Utah was maintained at an average of 63°F under the worst combination of adverse circumstances that can well be imagined. Thirty No. 200 Estate gas-fired Heatrolas were set at 25-foot intervals along the two aisles of the tent. Their general service was supplemented by four Moore Puritan No. 17 heaters and three radiant-fire heaters.

Lines Laid on Ground

Two 2-inch diameter high-pressure gas lines laid directly on the frozen ground under the wooden floor of the tent supplied the two lines of heaters. The gas was brought to the battery of four meters by 3-inch high-pressure line carrying gas at 90 to 140 inches, which pressure was reduced by two 2-inch Reynolds regulators to a meter-inlet pressure of 17 inches water column. The pressure of the far end of the low-pressure line was 9 inches of water column. Mixed coke-oven and water gas averaging 450 B.t.u. per cubic foot was supplied. The total consumption was 1.306,400 cu. ft. or a total of approximately 589 million B. t. u.

The average temperature maintained inside the tent was 63°, with an out-door average temperature of 35° and a minimum out-door temperature of 12°. Thus the difference between inside and outside was 28°F, maintained at the expense of approximately 2,700,000 B. t.u. per hour. If one assumes that there were two changes of air per hour and that the floor was at a temperature of 32°F, because it had ice under it during the entire period of the show, this would indicate a coefficient of transmission for the canvas areas of the side wall and the roof combined approximately 0.5 B. t. u. per square foot per hour per degree difference of temperature.

Protection Against Freezing

The heating up of the tent before the opening of the show was planned to occupy two days. The heaters were actually completely installed and put into operation as scheduled, but during the first night the out-door temperature at the meters and regulators fell so low that the regulators froze up, shutting off the gas supply. This difficulty was met by building a wooden housing about the meters and regulators and installing a small gas fired heater to keep this equipment from freezing.

To make bad matters worse, there was a considerable snow fall during the afternoon on which heating up was started and failure of the heating apparatus due to the freezing on the first night allowed a great deal of this snow to collect on top of the tent. When heating was resumed the following morning it was found necessary not only to melt the snow from the tent top, but also to evaporate the water formed by this snow, since sags in the tent roof allowed much of the water to drip through the canvas roof onto the floor of the tent. The outside temperature was 12° above zero and there was a steady wind blowing to add to the difficulties. Moreover, the dealers moved 140

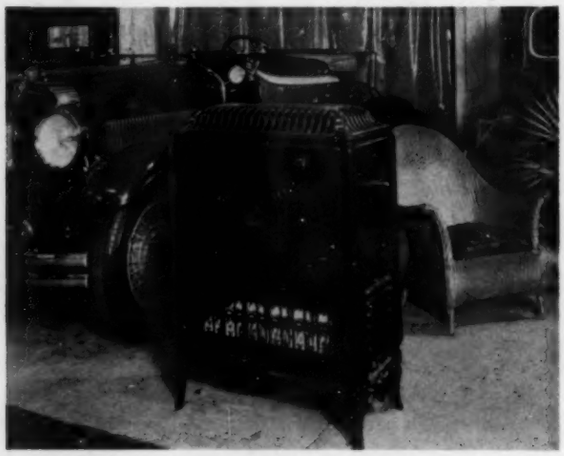
cars, representing about 300 tons of cold metal, into the tent and, of course, brought in with the cars a huge amount of cold air.

Indoor Comfort Maintained for Auto-Show Visitors in Mid-Winter with Only Tent Housing

Despite all the difficulties encountered the gas-heating system proved adequate and the show opened on time in comfortable quarters. This achievement was vital to the management of the show, for it had been agreed that an average temperature of 60°F would be maintained in the tent, both by promise to exhibitors and to the public authorities who granted the permit to hold the show. The anticipated advantages of cleanliness, ease of regulation, ease of installation, and low labor cost were all realized fully. The very great advantage of freedom from fire hazard, as compared with coal as a fuel, was an important factor.

Prestige Building

Not a little prestige in both industrial and household circles of Salt Lake City has been gained by this unique demonstration of the effectiveness of gas. People in this area logically reason that if a huge tent can be made comfortable for patrons and bare-legged entertainers in the middle of winter, it is undoubtedly thoroughly capable of caring for the ordinary industrial and household heating jobs which are carried out under much more favorable circumstances.



One of the 30 Heatrolas that Formed the Major Heating Battery.

Exhibitors at the Kansas City Convention, Natural Gas Association

Name and Address	*Booth*
A-B Stove Co., Battle Creek, Mich.	100, 101
Air Reduction Sales Co., New York, N. Y.	213A
American Cast Iron Pipe Co., Birmingham, Ala.	106
American Gas Journal	237A
American Gas Products Corp., New York, N. Y.	59, 60
American Heater Corp., St. Louis, Mo.	231
American Meter Co., New York, N. Y.	64-66, 79-81
American Steel Works, Kansas City, Mo.	213D
Arco Co., Cleveland, Ohio	73
Barber-Green Co., Aurora, Ill.	213C
Bastian-Blessing Co., Chicago, Ill.	312
Beckwith Co., Dowagiac, Mich.	239
B-Line Boiler Co., Cleveland, Ohio	18
Blodgett Co., Inc., The G. S., Burlington, Vt.	223
Bridge & Bleach Mfg. Co., St. Louis, Mo.	23
Bristol Co., Waterbury, Conn.	55, 56
Bryan Steam Corp., Peru, Ind.	206
Bryant Heater & Mfg. Co., Cleveland, Ohio	63
Burgess-Parr Co., Moline, Ill.	203
Century Stove & Mfg. Co., Kansas City, Mo.	216, 217
Chaplin Fulton Mfg. Co., Pittsburgh, Pa.	93
Clark & Co., Geo. M., Div., Chicago, Ill.	319
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio	207
Cleveland Heater Co., Cleveland, Ohio	7
Cleveland Trencher Co., Cleveland, Ohio	240, 241
Clow & Sons, James B., Chicago, Ill.	24, 25
Columbia Burner Co., Toledo, Ohio	229

Name and Address	*Booth*
Columbus Heating & Ventilating Co., Columbus, Ohio	15
Connersville Blower Co., Connersville, Ind.	38
Continental Supply Co., St. Louis, Mo.	54
Cooper Bessemer Corp., Mt. Vernon, Ohio	19
Crane Co., Chicago, Ill.	90, 91, 103, 104
Cutler Hammer, Inc., Milwaukee, Wis.	228
Dallas Foundry, Dallas, Texas	313
Dearling Valve & Mfg. Co., Williamsport, Pa.	75
Dayton Pipe Coupling Co., Toledo, Ohio	89, 105
Dearborn Chemical Co., Chicago, Ill.	98, 99
Detroit-Michigan Stove Co., "Garland Div.", Detroit, Mich.	50, 51
Detroit-Michigan Stove Co., "Jewel Div.", Detroit, Mich.	94, 95
Dresser Mfg. Co., S. R., Bradford, Pa.	52
Erectrolux Servel Corp., New York, N. Y.	26, 27, 28, 29
Eriez Stove & Mfg. Co., Erie, Pa.	202
Estate Stove Co., Hamilton, Ohio	107, 108
Fisher Governor Co., Marshalltown, Iowa	57
Fountain-Way Corp., Cincinnati, Ohio	208
Foxboro Co., Foxboro, Mass.	69, 70
French Co., A. F., Kansas City, Mo.	200B
Frick Reid Supply Corp., Pittsburgh, Pa.	48, 49
Garlock Packing Co., Palmyra, N. Y.	219
General Gas Light Co., Kalamazoo, Mich.	12, 13, 14
Giant Mfg. Co., Council Bluffs, Iowa	214
Grandview Co., Grandview, Mo.	213B
Groble Gas Regulator Co., Anderson, Ind.	215
Guardian Gas Appliance Co., Cleveland, Ohio	30, 31
Helme & McIlhenny, Philadelphia, Pa.	64, 81
Hill, Hubbell & Co., Tulsa, Okla.	213
Hoffman Specialty Co., Inc., Waterbury, Conn.	249
Holland Furnace Co., Kansas City, Mo.	243
Home Incinerator Co., Milwaukee, Wis.	62
Home Service Committee, A.G.A., New York, N. Y.	309
Homestead Heater Co., Newark, N. J.	8, 9
Hones, Inc., Charles A., Baldwin, L. I.	323
Hurley Machine Co., Chicago, Ill.	245, 246
Independent Stove Co., Owosso, Mich.	238
Johns-Manville Corp., New York, N. Y.	234
Kansas City Gas Co., Kansas City, Mo.	304
Kernit Incinerator Co., Ampere, N. J.	218
Knight, A. B., Fairmont, W. Va.	230
Lamneck Co., W. E., Columbus, Ohio	252
Lattner Mfg. Co., P. M., Cedar Rapids, Iowa	17
Linde Air Products Co., New York, N. Y.	42, 43, 44
Lindemann & Hoverson Co., A. J., Milwaukee, Wis.	227
Lunkenheimer Co., Cincinnati, Ohio	317, 318
Malleable Iron Range Co., Beaver Dam, Wis.	232
Maxon Premix Burner Co., Muncie, Ind.	300
McDonald & Co., D., Albany, N. Y.	65, 80
Metric Metal Works, Erie, Pa.	66, 79
Mettler Co., Lee B., Los Angeles, Calif.	16
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.	2
Moore Bros Co., Joliet, Ill.	10, 11
Mueller Co., Decatur, Ill.	82, 83
Mueller Furnace Co., L. J., Milwaukee, Wis.	84
National Cast Iron Pipe Co., Birmingham, Ala.	314
National Tube Co., Pittsburgh, Pa.	39, 40, 41
Natural Gas Magazine, Cincinnati, Ohio	315
New Method Stove Co., Mansfield, Ohio	200, 201
Ohio Foundry & Mfg. Co., Steubenville, Ohio	5, 6
Oil Well Supply Co., Pittsburgh, Pa.	36
Parsons Co., Newton, Iowa	235
Payne Furnace & Supply Co., Beverly Hills, Calif.	21, 22
Peerless Manufacturing Co., Louisville, Ky.	209
Permutit Co., Kansas City, Mo.	233
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.	67, 68
Pittsburg Water Heater Co., Pittsburgh, Pa.	85, 86, 87
Peninsular Stove Co., Detroit, Mich.	322
Pennsylvania Furnace & Iron Co., Warren, Pa.	253
Ray-Glo Corp., Athens, Ohio	310
Refinery Supply Co., Tulsa, Okla.	102
Reliable Stove Co., Div., Cleveland, Ohio	32, 33
Remington-Rand Business Service, Inc., Buffalo, N. Y.	200A
Reynolds Gas Regulator Co., Anderson, Ind.	92
Robbins Publishing Co., New York, N. Y.	301
Roberts Gas Burner Corp., Buffalo, N. Y.	74
Robertshaw Thermostat Co., Youngwood, Pa.	250, 251
Robinson Orifice Fitting Co., Los Angeles, Calif.	212
Roper Corp., Geo. D., Rockford, Ill.	71, 72
Ruud Manufacturing Co., Pittsburgh, Pa.	76, 77, 78
Safety Gas Main Stopper Co., Brooklyn, N. Y.	88
Security Stove & Mfg. Co., Kansas City, Mo.	222
Sheer Temperature Controls, Kansas City, Mo.	243
Sherwin-Williams Co., Cleveland, Ohio	37
Skinner Co., M. B., South Bend, Ind.	20
Smith Corp., A. O., Milwaukee, Wis.	305, 306, 307, 308
Sonner Burner Co., Winfield, Kans.	244
Spencer Thermostat Co., Cambridge, Mass.	1
Sprague Meter Co., Bridgeport, Conn.	3
Standard Gas Equipment Corp., Chicago, Ill.	224, 225, 226
Surface Combustion Co., Toledo, Ohio	210
Sweet & Doyle Foundry & Machine Co., Troy, N. Y.	242
Time-O-Stat Controls Co., Elkhart, Ind.	247, 248
Troop Water Heater Co., Pittsburgh, Pa.	34
Tulsa Stove & Foundry Co., Sand Springs, Okla.	221
U. S. Bureau of Mines, Bartlesville, Okla.	302
U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.	4
Victaulic Co. of America, New York, N. Y.	58
Vulcan Manufacturing Co., Kansas City, Mo.	311
Wailes Dove-Hermiston Corp., Tulsa, Okla.	96, 97
Walworth Co., New York, N. Y.	45, 46, 47
Webster Engineering Co. Div., Surface Combustion Co., Tulsa, Okla.	211
Welsbach Co., Gloucester, N. J.	320, 321
Westcott Valve Co., East St. Louis, Ill.	236, 237
Western Gas Magazine, Los Angeles, Calif.	35
The Wilcolator Co., Newark, N. J.	220
Worthington Pump & Machinery Corp., New York, N. Y.	61
Wood Mfg. Co., John, Conshohocken, Pa.	316
W-K-M Co., Inc., Houston, Texas	204, 205
Wyandotte County Gas Co., Kansas City, Kansas	303

Dehydration of Gas At San Diego, California

By J. A. Harritt

Superintendent, Gas Production, San Diego Gas & Electric Co.

DURING the past decade the very serious problem of the interior corrosion of gas distribution systems has become greatly aggravated. This condition has affected not only the oil-gas manufacturers, but is widespread through the industry, both here and abroad, and various methods are being studied and employed in affecting its mitigation.

Formerly, when gas standards were based on the candle power or illuminating value of the gas, all gas left the plant heavily saturated with oil vapors. These vapors were very largely condensable at decreased temperature and pressure, and upon condensing left on the interior walls of pipe and meters, a thin film of oil which insulated the metal parts against the action of the corrosive elements of the gas.

Water, a Corrosion Factor

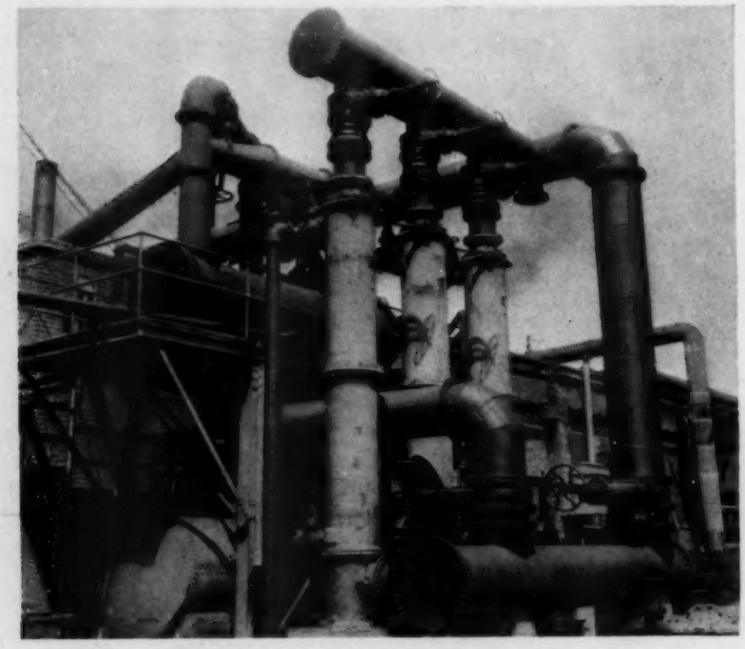
During recent years the illuminating value has given way to the calorific value as a standard measurement of gas quality, and the latter standard has been universally adopted. The change from the illuminating to the calorific standard was markedly successful. So, also, has been the later change, the lowering of the calorific power. Both changes, however, and particularly the latter, resulted in a change in manufacturing methods, whereby the oil vapors in the gas are almost eliminated by being transformed into a larger volume of stable gas.

Untreated gas, like the atmosphere, always contains water vapor which like the former oil vapor is condensible at decreased temperature and pressure. Whereas the condensing of the former oil vapors left a protecting oil film on the metal surfaces, the condensing of water vapors, washes the surfaces clean and the corrosive action of the gas is greatly accelerated in the presence of water. Water vapor, in itself is not harmful, nor are the corrosive elements in the gas particularly harmful in the presence of such vapor, but these elements in combination with liquid water rapidly attract the exposed metal surfaces, the action accelerating as it progresses.

This action results in large deposits in the distribution system, of "dust" where dry, and "mud" where wet. Repeated analysis of this material disclose it to be about 40% iron, variously compounded, but nevertheless iron which at one time was the inner surface of the pipe.

Compressor System Chosen

After long continued laboratory and semi-commercial tests on the various known and original methods of removing the water vapor from gas in an effort to minimize this corrosion, we decided upon the compression and cooling of our gas as the most adaptable to local conditions. We were already compressing some 65% of our total gas for high pressure transmission and distribution. In order to care for our winter peak loads, the capacity of our compressor station must greatly exceed our average demands. Thus it was necessary only to install sufficient cooler capacity and increase the load factor on the compressor station by the amount demanded by the low pressure system.



Andale Coolers through which circulates sea water

Before this complete installation was made—in April 1928—we connected a 6" high pressure line, through a 4" and an 8" regulator to the low pressure feeder. The drippage collected from the low pressure system was carefully checked, and the dew points surveys made weekly. The system gradually dried up, even with insufficient cooler capacity and spasmodic operation.

On July 10, 1928, with the installation of three Andale Heat Exchangers for coolers, the dehydration system was put

into full operation. The survey of conditions on the low pressure system was continued and the results of the improved apparatus were immediately noticed, in the rapid lowering of the dew point throughout the low pressure districts.

No drippage is now obtained from the entire low pressure system and the dew point of the gas averages 30° F. over that entire system. Since this is lower than any temperature to which the gas will be subjected, further condensation is impossible. This results in dry gas for San Diego, in so far as the low pressure distribution districts are concerned.

Operating Data

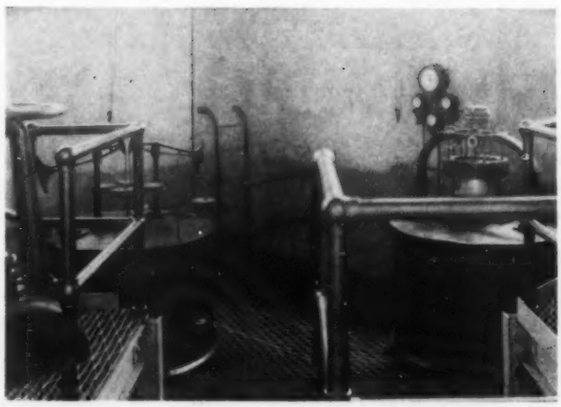
Gas is supplied to the coolers at 30 to 60 lb. gauge and at corresponding temperatures of 150°F to 250°F. at a fluctuating rate as demanded by the load. In its passage through the coolers it is chilled to 65° F. average, and is still further cooled by the expansion to 7" pressure, water column, after passing the regulators into the low pressure system. The water vapors are thus condensed in the coolers to liquid water and are drawn off through a steam trap.

Four and eight inch regulators reducing gas pressure from sixty pounds gauge to seventy inches water column pressure

A portion of the oil vapors, principally benzine, is also condensed out, this loss being in direct proportion to the illuminating value of the gas entering the coolers. The higher the percentage of C_6H6 and $C_n H_{2n}$, the greater will be the percentage of loss in oil vapors. At standard quality, 550 B.T.U., the loss does not exceed 4 B. T. U. per cubic foot. This is plant loss, as official measurements of gas quality are made after the gas has entered the distribution system.

Condensate removed from the cooling system at present averages 0.116 gallons per MCF of which 0.069 gallons is water and 0.02 gallons is oil. This oil is about 70% benzol. With our present 12000 M send out this produces daily about 1100 gallons of water and 240 gallons of oil which would otherwise enter the distribution system.

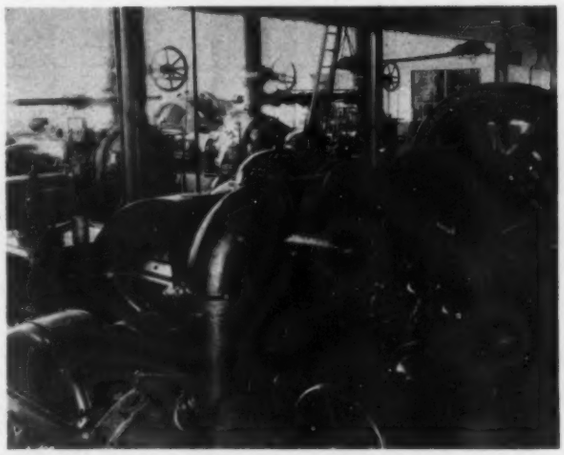
We have not yet determined the most economical disposal of this oil. At present it is added to the oil used for naphthalene absorption, whence it is constantly returned to the oil storage tank and thence back to the generators. Whether it will ultimately be added to the stock of motor fuel or put back into the gas mains following the dehydration apparatus is, as yet, not decided.



Thirty-six inch Connelly Balance Governor acting as a shut-off valve so long as pressure remains above six inches water column

While our dehydration is eminently successful in the low pressure distribution system, this is not quite true of the high pressure system. The gas leaving the aftercoolers is, of necessity, still saturated with its quota of vapors per unit of volume at that temperature and must be further cooled and expanded in order to depress the dew point to any considerable extent. Thus, as the pressure in the lines is decreased, due to the distance of travel or the removal of portions of the load, the vapors are condensed and the water and oil are found in the lines and drips. However, in passing through a regulator to lower pressures, whether it be a district regulator reducing to medium pressure or the house type regulator where the pressure is reduced to the 7" water column standard, the expansion results in dry gas after the regulator, thus preserving the meter, house lines and appliances.

An experiment extending over a period of two weeks, in which the gas in the aftercoolers was maintained at an average of about 15 lbs. above that required at the transmission and distribution manifold, gave a depression in the dew point throughout the high pressure system of about 8°F. New construction now under way will permit this experimental method of operation to be put into constant practice and we expect to obtain a



View in compressor station at San Diego showing regulators

considerable depression in the dew point of that gas, though not as satisfactory as obtained in the low pressure system.

This is not so essential, however, as corrosion difficulties are not so aggravated in the high pressure system, and the sole object in dehydrating the gas, is the minimizing of corrosion, thus prolonging the life of the distribution system, decreasing the unaccounted for gas, decreasing the annoyance to the public, caused by the tearing up of streets, etc., and giving to our customers a service even more satisfactory and free from possible interruption than they now enjoy.

Costs of Dehydration

Exact costs, if it were possible to obtain them, would be misleading, as they would vary greatly in different plants; and in any one plant they fluctuate with the load, larger quantities decreasing the unit cost and vice versa. Under conditions peculiar to the San Diego plant our dehydration cost per M sendout is approximately $0.00875, with our daily sendout load of 12000 M.

How to Measure and Discount Growth

Suppose a straight line of trend is to be fitted to the data of annual production for the years 1904 to 1914 in the XYZ Company. The data are given in Column (a) of the accompanying table.

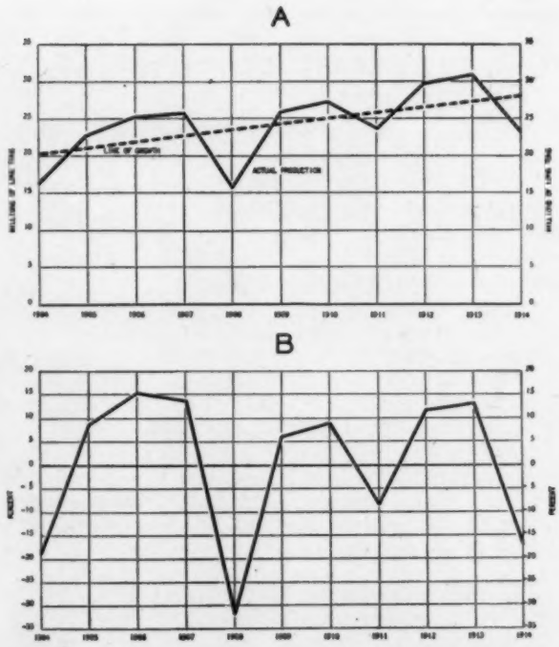
CALCULATION OF STRAIGHT LINE OF GROWTH

(Annual Production of XYZ Company, 1904-1914 Inclusive)

(Unit: thousands of long tons)

Year	Original Item (y)	Deviation From Origin in Units of Time (x)	Deviation Times Original Item (xy)		Deviation Squared (x^2)
	(a)	(b)	(c)		(d)
1904	16.50	−5	−82.50		25
1905	22.99	−4	−91.96		16
1906	25.31	−3	−75.93		9
1907	25.78	−2	−51.56		4
1908	15.94	−1	−15.94	−317.89	1
1909	25.80	0			0
1910	27.30	+1	27.30		1
1911	23.65	+2	47.30		4
1912	29.73	+3	89.19		9
1913	30.97	+4	123.88		16
1914	23.33	+5	116.65	404.32=Σxy	25=Σx²
	267.30=Σy			86.43	110

The middle year of the period is next determined as being the year 1909. This year is consequently regarded as the origin of time; in other words, the point at which x equals o. Other values of x are given negatively for the earlier years and positively for the later years, as shown in column (b) of the table. The sum of all the y's (Σy) is 267.30. Therefore, the intercept b, which equals $\frac{\Sigma y}{n}$ is equal to $\frac{267.30}{11} = 24.3$. The values of the several xy's appear in column (c). The algebraic sum of these is 86.43. The total of all the x's squared is 110. Therefore the annual rate of growth, which equals $\frac{\Sigma xy}{\Sigma x^2}$ is equal to $\frac{86.43}{110} = .7857$. The equation of the straight line of trend for production from 1904 to 1914 is, thus, $y = .7857\ x + 24.30$, the origin of x being 1909.



The equation states in mathematical form that the long-time trend of production during the period 1904 to 1914 called for a production of 24.30 million long tons in 1909, the year standing at the middle of the period, and an increase of .7857 million long tons during each year of the period. This being the meaning of the equation, the value of the line of trend at any particular point of time is readily ascertained. This value of the line of trend, commonly referred to as the ordinate of trend, is to be found by adding to, or subtracting from, the intercept (the value of y at the origin of time) the number of increments (an increment being equal to the value of m) corresponding to the number of intervals of time (represented in the value of x) from the origin to the date in question. Thus, for the year 1904, x = —5. The value of y — in other words, the ordinate of trend — for 1904 is therefore given by the expression: y = (—5) .7857 + 24.30 = 20.37 million long tons.

The elimination of growth is readily accomplished by having figured the ordinate of trend for each year, finding by how much each year's actual output exceeded or fell short of the growth line for that year, and dividing the difference by the ordinate of growth for that year.

The original set of data and the computed line of growth is pictured on the upper portion of the accompanying chart, while the record as it looks *after eliminating growth* is shown below on the same chart. There the growth line is of course reduced to a straight *horizontal* line.

This method will be found, on trial, to work out more simply than it may appear in the general formula. It is of course readily applicable to sales or other data just as well as to production, subject throughout to one proviso—namely, that the record in question be of the sort which fluctuates about a straight, rather than a curved, line of growth.

—*Executives Service Bulletin*

TECHNICAL AND GENERAL MISCELLANY

NEW METHODS OF PRODUCING GAS

In the year 1925, the German Association of Gas and Water Technologists decided to recommend the manufacture of a mixed gas, containing water gas and coal gas, to have a calorific value of 4200 kilogram calories per cubic foot (32 degrees F). This has given rise to the development of new methods of gas manufacture in Germany which have had an important effect upon the gas industry as a whole. It has resulted not only in the saving of coal but also in making it possible more accurately and conveniently to adapt the gas making process to the gas demand, and also to remove the tension from the coke market.

The improvements in the gas making process are discussed by Dr. R. Geipert in an article published in Das Gas und Wasserfach, 1929, pages 169-174 and 205-210. Various matters are discussed in this article, such as saving in gas coal, relieving the load on the retort house, adaption of the gas making process to the varying gas consumption and the economy of the process, heating the carbonizing retorts and chambers, operating results obtained from two vertical retort installations, comparison of these results, the ash content of coke in the wet quenching process, the strength of coke quenched by the wet method, the gas liuqor, cooling gas, waste heat boilers, the water gas installation, including such topics as the flat grate, the rotary grate, steam jackets, choice of coke, action of the steam on the clinker, hot blow, blow air mixing and cost, explosions, the gases obtained, frequency of make runs and daily load, depth of fuel in the generator, and use of waste heat boilers, mixing the water gas and the coal gas, alternate operation of water gas production in the carbonizing retorts and in the generators, carburation of the water gas, influence of the mixed gas production on the quantity of coke to be sold and finally the fundamentals of various methods of operating the mixed gas process.

REACTIONS AND GAS FLOW IN GENERATORS AND THEIR DESIGN

The percentage of hydrogen in the gas which is formed in the generator is a better criterion of the efficiency of the generator operation than the percentage of carbon dioxide. Determinations of the gas composition at points within the fuel bed show that the various reactions occurring therein take place in zones, not disposed horizontally but extending to the surface of the fuel bed. The gas of the central zone is of good composition, but that in the outer zones contains successively greater percentages of carbon dioxide. The position and width of the zones contributing carbon dioxide to the gas depend on the cooling of the fuel bed near the outer surface of the generator.

For each size of fuel there is an optimum depth of fuel bed, further improvement of the gas being then possible only by increasing the diameter of the generator, assuming at the same time that it is possible to maintain a uniform distribution of air over the cross-section. The reactivity and the sieve analysis of the fuel are of importance in judging its suitability for use in the generator. The amount of dust in the gas and the resistance of the fuel bed to the air are determined principally by the proportion of fuel less than five millimeters in size.—*E. Terres, Das Gas und Wasserfach, Volume 71, pages 1205-1213.*

PETROLEUM WASH OIL THICKENING IN SCRUBBING COKE OVEN GAS

The causes of thickening are supposed to be as follows:—

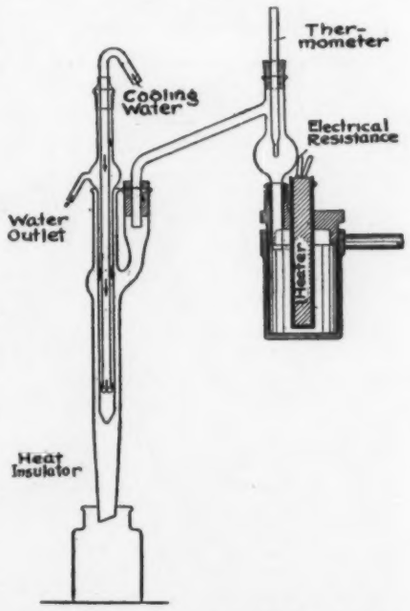
1. The oxygen content of the gases and its influence on the wash oil, especially on the phenols of the wash oil.
2. The oxidation of sulphuretted hydrogen to sulphur and its asphalt forming property.
3. The capacity of the oils for inorganic materials, especially compounds of iron and their catalytic influence on the process.
4. The moisture content of the oils.
5. Cracking.
6. The prevailing pressure on the system.

These causes were investigated. It was found that the thickening in petroleum wash oil is the direct result of a tar or a tar constituent in a finely divided form suspended in the gas, which still persists in measurable quantities when the gas has reached the domestic consumer. It would appear then that thickening results from the direct baffling of this material in the absorption system and from its solution in the light oils with subsequent precipitation on stripping. This is perhaps the reason for the opinion sometimes expressed that thickening is produced by polymerization in the stripping stills.

Experimental work using a cottrell precipitator indicates that the removal of these high-sulphur tar constituents from the raw gas before entrance into the scrubber system will eliminate the thickening of wash oil in the countercurrent scrubbing of coke oven gas.—*H. M. Ullmann, D. S. Chamberlain, C. W. Simmons and M. A. Thorpe, Industrial and Engineering Chemistry, April 1929, pages 313-4.*

NEW METHOD FOR ANALYZING TAR

A rapid method for the determination of the water content of tar involves the use of xylol. The principle of this method is as follows. Thirty to fifty grams of tar are mixed with two hundred cubic centimeters of xylol and the mixture is then distilled, care being taken to avoid the contents foaming. The water is entrained by the xylol in the form of vapor. The products are condensed in a graduated vessel. Inasmuch as water and xylol are practically non-miscible, the volume of water may be directly read off the scale, after the vessel has been allowed to stand for fifteen minutes.

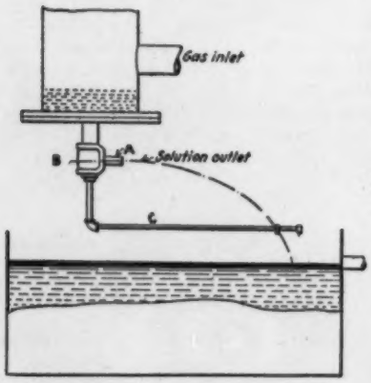


The apparatus used in distilling the tar to determine its composition is shown in the accompanying illustration. The heating is accomplished by electricity. The retort or rather distilling flask is special. It is composed of a cylindrical tube 14 millimeters in diameter and 150 millimeters long, which is enlarged in its middle to form a bulb of thirty millimeters diameter. A thermometer is inserted into the apparatus so that it reaches the spherical central portion. The sample fills the lower part of the tube and the largest portion of the spherical part. The distilling flask is connected with the cooling arrangement by means of a side tube

and is provided with an adapter. The vapors pass into a vertical condenser. A tared and graduated receiver is provided for collecting the condensates.—*Journal des Usines a Gaz, Volume 52, pages 86-88.*

SIMPLE LIQUID FLOW INDICATOR

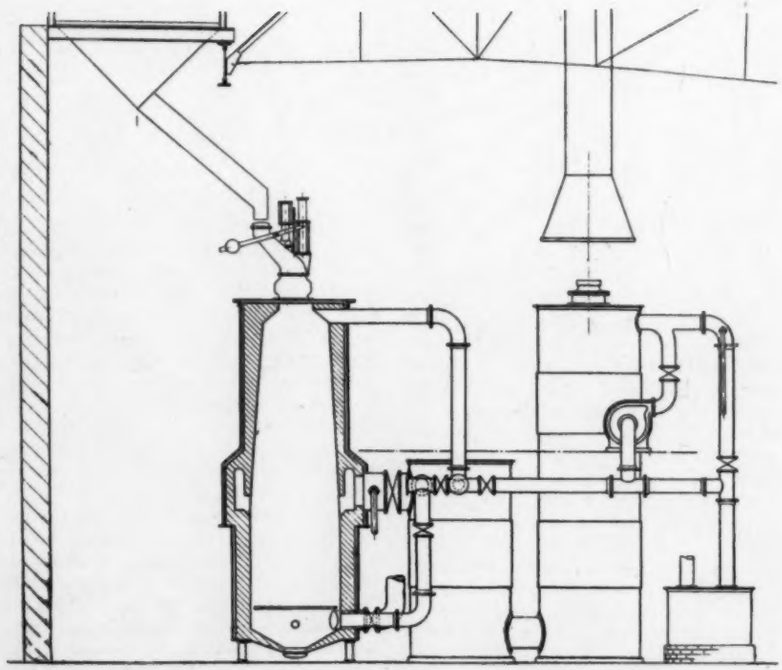
The indicator which is shown in the accompanying illustration is particularly useful in connection with the control of the rate of flow of liquids over experimental or other scrubbing towers. It consists of a nipple A which is screwed horizontally into the outlet pipe B of the scrubber in such a manner that the parabolic stream of solution from the outlet of the scrubbing tower will impinge



on the rod C. At the desired rate of flow of liquid, measured by means of a measured pail and a stop watch, the point at which the stream strikes the rod is marked in any convenient manner. Any deviation from this rate of flow is instantly visible. By the use of this method the inaccuracy due to undetected variations in the rate of flow and the inconvenience of periodic check of the rate by means of a pail and stop watch may be avoided. Care should of course be taken to provide sufficient capacity between the bottom of the scrubber and the gas outlet pipe to prevent flooding of the latter at the maximum rate of flow.—*L. Logan, Chemical and Metallurgical Engineering, March, 1929, page 171.*

COMPLETE GASIFICATION PLANT

The plant is shown in diagrammatic form in the accompanying illustration. The blow takes place through the lower part of the generator, or water gas production zone, and the products are led off, by way of the annulus, through the hot gas valve into the carburetor top. In the carburetor and superheater the sensible heat and latent heat of these products are stored and subsequently utilized to assist in the carbonization of the coal by transference back to the generator, and partly



for carburation of the gas produced. Coal gas is led off from the upper part of the generator or carbonizing chamber during the blow, and passes to the washer through a separate seal.

During part of the run the coal in the upper part of the generator, or carbonizing chamber, is carbonized by the sensible heat of the water gas resulting from a back-run produced by admitting steam to the superheater top, superheating it in the carburettor and superheater, and admitting it to the generator base. During this back steaming period gas is circulated with the back-run steam through the fixing chambers, thus augmenting, as necessary, the supply of heat to the generator. The gas circulated is taken from the supply issuing from the generator top before it enters the washer. *Gas Journal, March 13, 1929, pages 727-29.*

FORMATION OF COKE

A number of interesting experiments were carried out on different coals. The coals were used both in the lump and in the pulverized condition. They were heated to a temperature of 900 degrees C in an experimental apparatus, and the rate of heating was varied so that the rise of temperature was either one degree or five degrees C per minute. In all cases the rate of heating was maintained constant during the progress of the experiment. It was found that when the coal was heated at the slower rate, the degree of swelling was approximately proportional to the content of carbon in the coal. This varied between 82 to 85 per cent. It was also found that there was no definite relationship between the degree of swelling and the rate at which gas was developed during the plastic period.

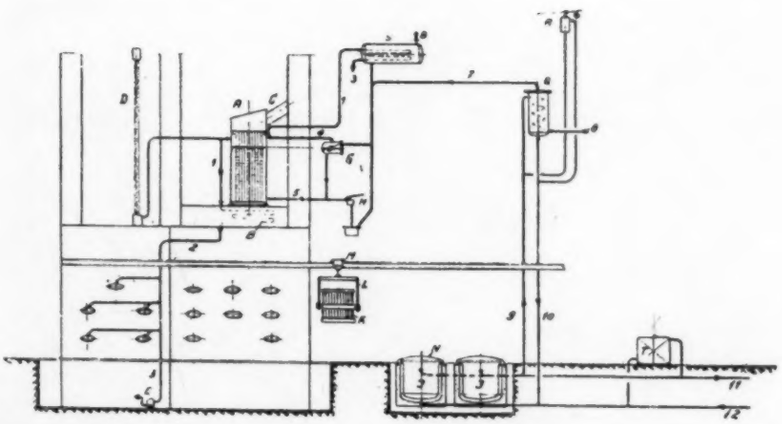
A study was also made of the effect of the rate of evolution of tar on the formation of coke and on its quality as well. Cokes which were produced from coals, which had been previously heated to various temperatures, between 390 and 450 degrees C, were used in this study. The coal was extracted with ether and it was examined both before and after this extraction had taken place.

The author states that it is possible that the first stage of coke formation from crushed coal is the liquifaction of the tar and its oozing to the surfaces of the particles. This takes place until these particles are thoroughly wetted with the liquified tar. In the second stage of coke formation, the particles lose their identity and the result is the formation of a porous structure. This is directly due to the swelling of the particles of coal.—*R. A. Mott and T. Shimmura, Fuel, Volume 7, pages 472 to 486.*

DRY COKE QUENCHING INSTALLATION

The accompanying illustration shows the various parts of the installation. The steam boiler is located at A above the retort bench. The flow of gas is controlled by means of valves. Before entering the stack flues, the gas passes through the superheater B, thence through the banks of boiler tubes and finally through the flue C into the stack.

The boiler operates only at one atmosphere pressure and is provided with the



safety device D. The superheater B is used for superheating the steam to a temperature of 300 degrees C so that it can be used in the manufacture of water gas. The steam is carried from the superheater to the retorts, five in a bench. The pipes distributing the steam are carefully kept free from water of condensation. They are accordingly connected to a condensate collector E. An automatic arrangement assures regular feed of steam. This device is shown at G. The water fed to the boiler comes directly from the heater Q. The boiler is thus constantly fed with hot water. This arrangement has still another advantage in that the water arrives in the boiler in a purer state. An apparatus is inserted between G and the boiler for the treatment of the water with sodium carbonate. The controlling device G is moreover connected with the steam generating chamber in the boiler so that the level of water is the same in the two vessels. A hand pump H, which also receives water from the heater Q, can be used to feed the boiler A in an emergency.

The boiler A is of the vertical tube type. All the parts of the boiler are soldered, not a rivet being used in its construction.

The coke is removed from the retorts directly into the skip K. The skip is then lowered directly into the coke quenching chamber which is covered with the cover N. The chamber is provided with a jacket in which water is heated by the heat from the coke and this hot water then flows up into the heater Q through the pipe 9. Cold water is allowed to flow into the chambers, so that a constant heating takes place.

Many advantages are cited for this system of quenching coke. One of these is the recovery of gas contained in the coke. The quality of the coke is better and a constant supply of hot water is obtained.—*Journal des Usines a Gaz, Volume 52, pages 557-8.*

DRY CLEANING COKE FOR CARBONIZATION

The problem is studied from the standpoint of the distribution of the ash in the various portions of the raw coal. The density of the coal and the slack that it contains and the size of the particles are important. It is interesting to note that there is almost a parabolic relationship between the percentage of ash and the percentage yield of clean coal. Figure 1 shows this for two coals.

As far as the size of particles and the production of low ash coke are concerned it is stated that in all types of coal cleaning machinery, as the particles undergoing separation become smaller, the separation up to a point is uniformly good for all sizes; then, as the size of particle diminishes still further, a falling off in efficiency becomes apparent until, finally, there is a limiting size of particle beyond which no ash reduction can be effected.

Sulphur reduction by cleaning the coal is also a factor. The sulphur may be present in so finely a divided a state and so intimately associated with the coal substance in varying proportions that reasonably low ash particles are weighed down by their content of pyrites and are found amongst the intermediates. Sometimes the high ash refuse contains only a little sulphur, so that the removal of the latter does not mean that sulphur is also removed in proportion.

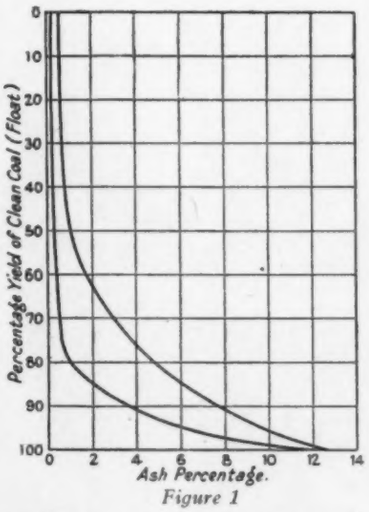


Figure 1

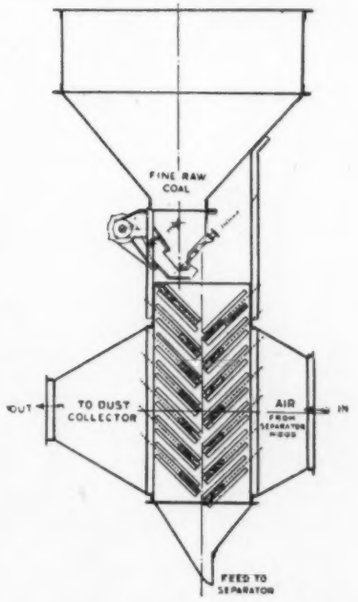


Figure 2

Various systems of pneumatic separation are described. The dust particles are removed by means of an apparatus shown in figure 2. This consists essentially of a mechanical feeder which distributes the fine coal in a thin stream into a series of facing louvres through which a current of air is drawn.—*J. Curry, Gas World, 1928, pages 16ff. Coking Section.*

SPECIFIC HEAT OF AMORPHOUS CARBON AND SEMI COKE

It is indicated that the specific heat of semi coke is dependant on the thermal preliminary treatment. The specific heat of the semi coke increases as the temperature of carbonization of the coal decreases. Pure carbon was prepared according to three different methods, and here again tests were made to determine whether or not the specific heat of the carbon is affected by the preliminary thermal treatment. It was found that the method of preparation did not affect the thermal properties of the carbon. The specific heat of semi coke made from gas coals is greater than that made from ordinary coal, or rather that the specific heat increases as the volatile matter in the coal increases. The importance of this work is manifested when experiments are made to determine the heat of decomposition of coals and the transmission of heat through the coal and coke during the carbonization process.—*Das Gas und Wasserfach, Volume 71, pages 265ff.*

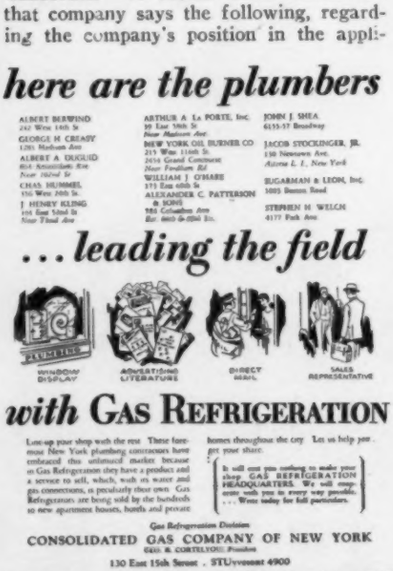
This Sounds Logical

"Well, we see the freebooters are with us again," said a certain furniture dealer the other day. "I do not see how the gas and electric people can expect dealers to become enthused in the sale of household appliances when their plans almost invariably include, as a premium with the sale of such appliances, an article of merchandise which we sell and on which we expect to make our regular profit.

"I do not see how they can expect us to extend our payments in the manner in which they do; and most of all, I do not see how they can expect us to sell at the same prices they sell at. We are in this business to make a fair profit on every item we sell. We must recognize the fact that it is our sole means of livelihood and we cannot afford to keep our stores open on any other basis. I have no doubt, if some plan could be devised whereby gas and electric companies would employ the same methods that we as independents are forced to employ in the mark-up of goods and in the matter of sales, that as a whole we could do a much better job for all concerned and materially increase the sale and use of home labor-saving devices. However, we cannot, and do not intend to try to do it on the basis on which the utilities are now doing business. This is not only my personal view of this question. It is the attitude taken by any number of other dealers whom I have talked to doing business in the furniture and other lines of merchandising."

What this man says is very true. It seems that if the gas companies are to secure anything like a full line of appliances in the homes, such an effort is highly commendable. Surely if a half dozen reputable dealers, (or a hundred as the case may be) were pushing a full line of gas appliances for all they were worth, there would undoubtedly be a greater probability of the gas industry securing a maximum of profitable customers than is possible where they are "going it alone."

At this juncture it might be well to state that in certain sections of the country a co-operative effort working in this direction, is now being employed. In the territory covered by the Consolidated Gas Company of New York such an effort is in operation and the Consolidated Company is going a step farther. They are not only securing dealers and co-operating with them in the sale of gas appliances, but they are doing a portion of the advertising for the dealer, as may be seen from the advertisements reproduced here. Another company which lends it's aid to the dealers in the territory served by it is the Pacific Gas & Electric Company of California. A recent advertisement of that company says the following, regarding the company's position in the appli-



ance field: "We believe that the Public must be served: That the best public service can only come from a united industry, composed of utility, appliance manufacturers, jobber and dealer trades. That the organized effort of the entire industry is essential if a maximum amount of business is to accrue to each group through creation of consumer acceptance of our products.

"That it is the duty of the utility particularly to do pioneer selling in that appliance field where there is no public demand, or, due to special conditions, no adequate retail profit for creative and aggressive selling by retailers.

"That the utility, in addition to supplying quality service at fair rates, assume leadership in the sale of quality appliances at established retail prices, adhering to ethical, constructive merchandising methods on a basis that will encourage the activity of all legitimate retailers.

"That such ethical leadership has stimulated and will continue to stimulate buying of appliances, installation work and general supplies: That the Pacific Gas and Electric Company will continue encouraging as many legitimate retail appliance dealers as can economically operate; continue to co-operate with such natural outlets by financing and executing constructive, educational selling and advertising campaigns. That merchants and dealers can, and should, retail appliances at prices fair to themselves and the public by such methods as have been found to be sound by successful retailers."

It seems that such a policy would greatly stimulate the activity of such legitimate dealers as would be desirable in any locality to put over a first-class selling job. Either of the plans used by these individual companies, the Consolidated Company or the Pacific Gas and Electric Company, will furnish any company actually desiring to establish a city-wide effort, with a very effective plan to model after. However, it would seem advisable to be reasonably positive, before any such plan is offered dealers, that the company actually realizes that they must go through with their end of it for a definite period of time before the matter is even broached to the dealer. Once the decision is made to make such a plan operative, see that it is carried out to the letter, because the dealer as a whole is not so sure that the gas company has any such desire to sell appliances on that basis.

This condition has been brought about by a lot of loose talk by both gas men and appliance manufacturers and in some instances it is the result of manufacturers losing interest in the dealers after they have sold their line to the utility.

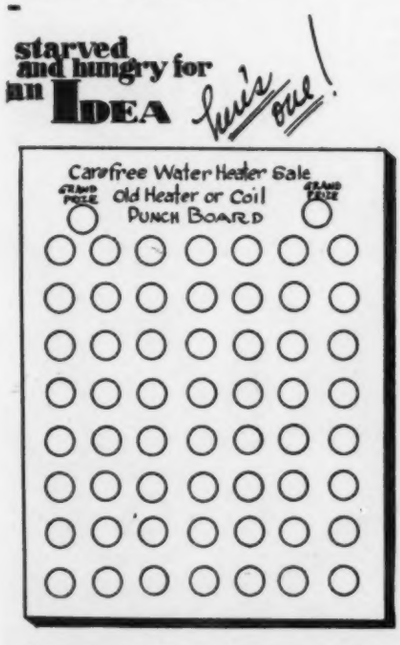
These facts may be stated rather bluntly, yet they are facts. If we really desire to work out a co-operative scheme of merchandising gas appliances, facts

are the things we will have to deal with, a big one of which is that no real dealer will undertake to put over a mammoth selling job that carries no profit for him. You can't blame him for this attitude and it is just as well to understand it at the outset. No matter what we think of these men as merchandisers of home appliances or what amount of hard work we feel it will incur to properly train them in order to have them put forth the desired effort in that direction, if we expect them to operate without a fair and reasonable return upon their investments we may as well forget it entirely.

The Extra Punch

Stimulating salesmen to add an hour or two to their daily drives for orders is indoor sport which we highly recommend. Anything that will give the salesmen an opportunity to earn an extra dollar honestly is healthy recreation, notwithstanding the Scotch idea held by some salesmanagers that too much money is not good for retail salesmen.

With this thought in mind, we want to pass on a little suggestion which we picked up in the office of the salesmanager of an Electric Company. This man, staging a sale of electric irons, was offering a premium of a dollar for any old iron, was doing a whale of a lot of advertising and was paying regular commissions and a bonus on all sales. He further decided to throw in an extra "iron-man" or two for each and every sale. (He had made a good record on a similar sale last year and was out to break a record again.)

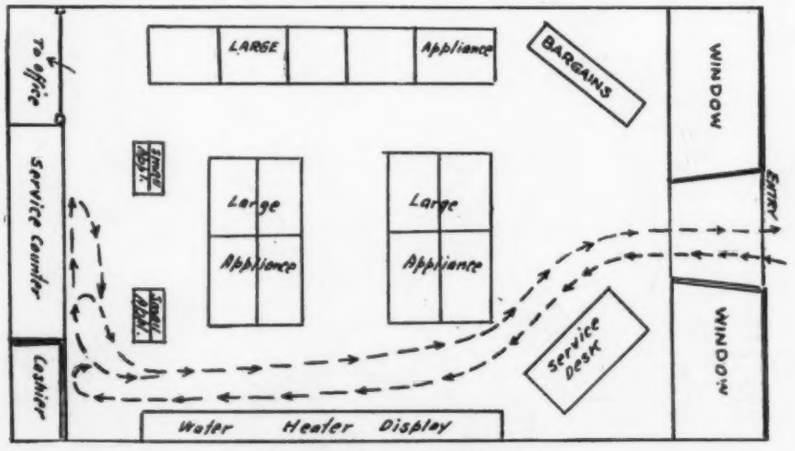


Accordingly, this salesmanager devised a punch-board on the order of the one shown in the sketch, and every time a salesman brought in an order it entitled him to a punch on this board and an extra dividend on his sale, as there were no blanks on the punch-board. In order to still further speed things up, the men were urged to try for the grand prizes which were given to the two last men bringing in signed orders.

The boards were made up to contain fifty-six punches but there was no limit to the number of boards as long as the sale was in force. This idea might be used in connection with the sales of any number of gas appliances.

Store Lay-Out

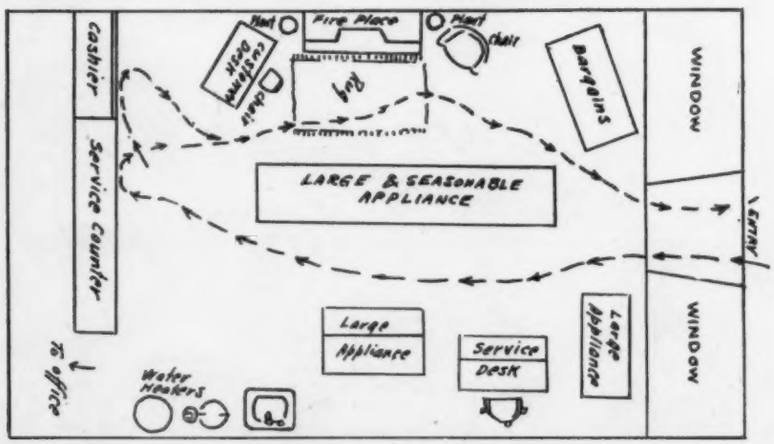
Store lay-out is a vital factor in aiding store sales. If a little thought is given to the planning of your store lay-out the manner in which your merchandise is exposed to sale you may increase your store sales very materially. Gas offices with a combined sales floor are just as susceptible to a studied lay-out as any other type of retail establishment.



Store lay-out—Plan No. 1

To illustrate; plan one (a combined store and office) indicates the travel in a store that we visited not long ago; the arrows represent the path taken by the average customer entering the store to pay a service bill and the usual route by which he left the store. This was due to the arrangement of the cashier's cage and the service counter. You will note that customers passed the same merchandise upon leaving the store that they did upon entering it, and that they did not get near the "bargain counter" where the small kindred merchandise was displayed nor did they view a number of the major appliances on display. After observing this fact for some time we made up plan two and we are of the opinion that if this same store were to revise their present plan and lay-out their store as shown in this new plan they would observe an increase in store sales immediately.

Plan two is laid out in such a manner that the customer would be more likely to traverse the whole sales floor and thus view all of the merchandise displayed, and be more apt to see the specials on the bargain table. When you decide that you want more store sales work out a plan of this kind and try it. Install a fire place and connect a radiant gas heater; put down a rug and a couple of chairs and make a cozy corner for the display background and for your cus-



Store lay-out—Plan No. 2

tomers convenience and place your bargains and small appliances where folks will see them as they pass out of the store.

Do not place small appliances or kindred merchandise in glass cases; place them where the prospective purchaser may pick them up and examine them. Be certain that they contain price tags. Use the same system the department and chain stores are using to sell small items of merchandise.

Snappy Window Trim

The month of May, as a rule, finds the gas man selling, or about to sell, circulating gas water heaters. As a suggestion for a window display to be used during such a sale we are reproducing a window which attracted a lot of admirers in a mid-western city last year. This window is very simple in design and needs little or no explanation. As we see it, the one big idea behind it is that the lion attracted the attention of the folks passing by the window and caused them to stop for a second look. Once they stopped, the three cards and the four heaters told the story.

This is the type of window that may be built by any gas man. If he doesn't happen to have a lion to attract the attention of passers-by, he could use the "mystery spigot," or he could devise any one of a hundred other center pieces to attract folks to his window. We know a man who used a huge red question mark as a magnet with which to draw people to his window. Directly under the question mark he placed a card printed in one inch letters, which read "During May we will install this famous — water heater in your home for only 95 cents."

It Pays to Advertise

It frequently happens that the gas man in the smaller cities acts as advertising man, display man and salesmanager and, because of the various duties to be attended to in each capacity, he is not at all times able to give to each of these jobs as much time and thought as he would desire. In checking up a number of the smaller situations we have found that, unless the man whose duty it is to attend to the various and sundry details in connection with the aforesaid jobs has a hankering for advertising, that phase of his work is most likely to be slighted. We find that in every instance the gas man has some sort of a contract with the local weekly or daily newspaper for a given amount of white space to be filled each week. Thus, he is of the opinion that "it pays to advertise."

We also find that a great deal of his advertising is administered in this manner: Due, we'll say for want of something better, to good salesmanship upon the part of "ye editor," the gas man when first approached on the subject, at the expiration of his yearly or semi-yearly contract, gets all "hopped-up" over the idea of running some good ads, and having his copy all worked out and ready for the newspaper two or three days in advance of publication date. He does this for a week or two, until such a time as he gets tied up in a campaign of some sort. Then he just plumb forgets all about that newspaper ad until the editor sends for it saying, "have you got that ad ready for us; tomorrow's Thursday and you know that's your day to run." "By George!" says the gas man, "You know I do not have a thing ready." As he says this he is rummaging through the drawers of his desk; "you know I do not know just what to give you." At this juncture he uncovers a lot of mats sent in by some manufacturer and he says, "ah! here's one just the size; let's see, yes that's a Blank Range; yes that's all right; just run that tomorrow."

And out goes mister editor with his ad. And the gas man advertises, "it pays to advertise" even if the printer neglects to mortice out the words "Dealer's Name Here" and insert the name of the company.

Some of my readers may think this is laying it on pretty heavy and to them I say if you doubt that this is a fact spend a couple of dollars for a press clipping service for a month and see for yourself just what is happening along this line.

To obviate just such foolishness, advertising men here and there are now working out a series of advertisements to offset this loss, for that is exactly what it amounts to. These advertisements are

(*Continued on page 59*)

READY MADE ADS.
"IT"
And now a GAS RANGE has "It" . . . a Broiler that slides in and out like a drawer, making the broiler and broiling food instantly accessible without the slightest difficulty or inconvenience.
See this Modern Gas Range at our store and let us tell you how easy it is to own one.
Illinois Power and Light Corporation
Doctors
recommend broiled foods for their greatest health-giving value . . . broiling is made easy with the new Universal In-a-Drawer Broiler Gas Range — Sold on easy payment plan.
See This 1929 Gas Range At Our Store
Illinois Power and Light Corporation

HIGH PRESSURE STORAGE HOLDER

You can Add the Sections as you *Need* Them—

A BOON FOR THE NATURAL GAS INDUSTRY

A *Six* section "Stacey Bullet" compression holder can conveniently be converted into a *Thirteen* section, or more, holder by the addition of the required number of sections such as shown by the light portion in the illustration above.

The utility and practicability of the "Stacey Bullet" will be immediately obvious to the Natural Gas Industry, as well as to the Manufactured Gas Industry for, by the use of the additional sections, the necessity for building new and expensive gas holders is obviated, thus saving much valuable ground space. Other strong points in favor of the "Stacey Bullet," low cost of maintenance due to its shape and permanent tightness, and the ability to fabricate and erect at least expense, because built on established boiler principles. The smallest unit for the "Stacey Bullet" will compare favorably in first cost with any other form of pressure storage and yet the cost per cubic foot varies inversely with the size.

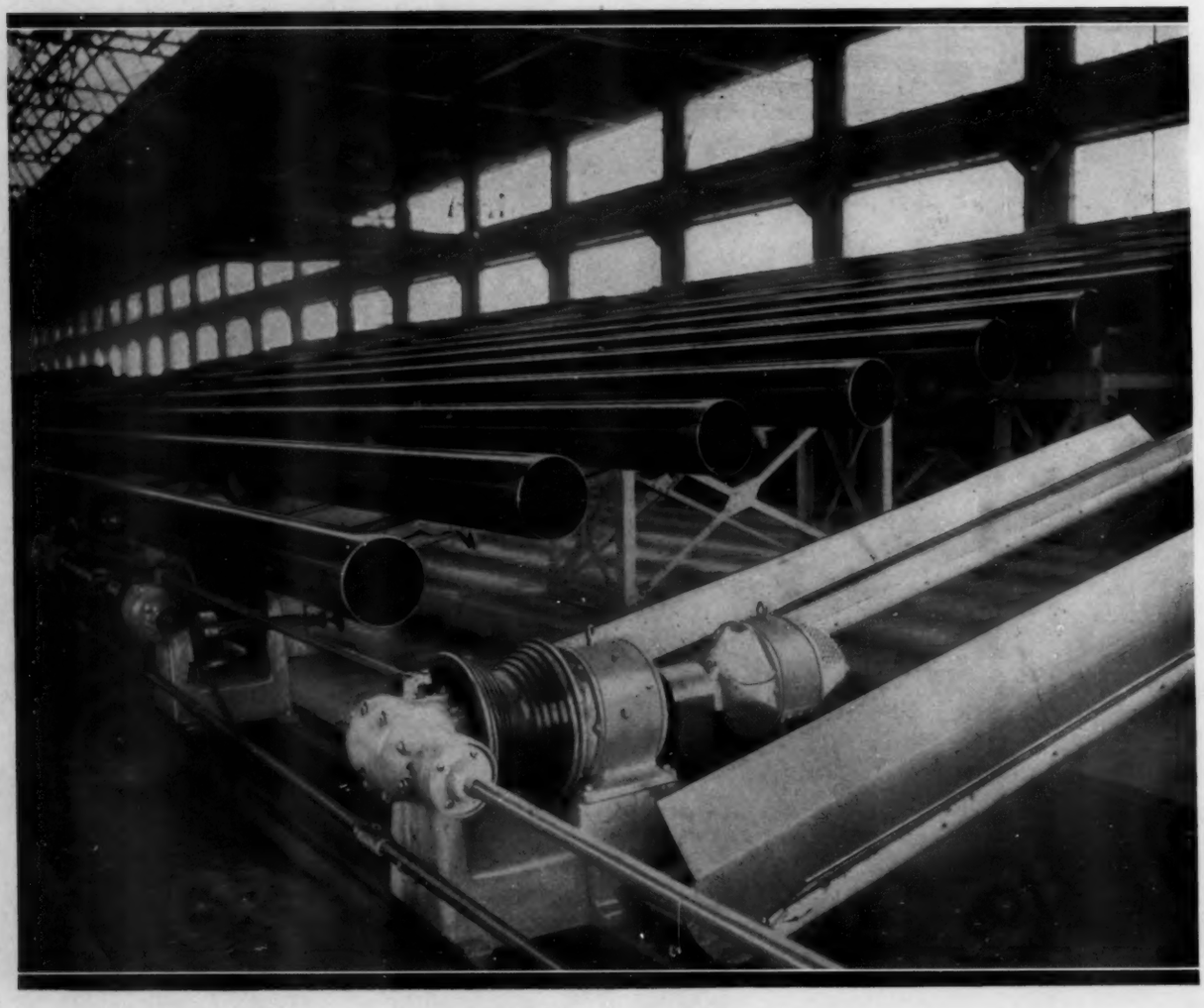
Let us tell how the "Stacey Bullet" is particularly adapted to the Natural Gas Field.

STACEY BROTHERS GAS CONSTRUCTION CO.

CINCINNATI, OHIO

JAMES E. STACEY, Pres. ANDREW J. STACEY, Vice-Pres. WAYNE STACEY, Gen. Sales Mgr.
ARTHUR A. POPE, Sec. and Treas. WILLIAM A. MILLER, Chief Eng. P. C. RODGERS, Asst. Sales Mgr.
NEW YORK OFFICE—75 West Street—P. F. McEnaney, Mgr. Tel. Bowling Green 8186
New England Representative—Eastern Service Co., Boston

Capacity is *now*



SMITHWELDED

25 miles per day

The new Pipe Mill of the A. O. Smith Corpo ration is now in production. Capacity is now 25 miles per day 8⅝ to 26 inch O. D. inclu sive, SMITHWelded Oil and Gas Line Pipe.

A. O. SMITH CORPORATION

Oil and Gas Field Products Division

General Offices: MILWAUKEE, WISCONSIN

District offices at: New York · Pittsburgh · Tulsa · Houston · Los Angeles

LINE PIPE

Manufactured Gas in Chicago is being distributed by means of Cooper Engines

IN the North Shore Avenue distributing plant of the Peoples Gas Light & Coke Company this Cooper 500 horse power gas engine has for nearly four years been driving a rotary blower, whenever its capacity has been needed. It is used to pump gas from the holder into the distributing mains for the peak demands. A duplicate unit was installed in 1928 in this company's 73rd street plant.

A Cooper gas engine is well fitted for such service. Its installation cost is lower than for a steam plant. It has no standby losses other than interest charges. Its operation is not affected by outside influences as is so frequently true of motor driven compressors when the electric power is interrupted. It is a cheaper source of power than electric power. It uses the same gas for fuel that is being distributed. Let a Cooper engineer explain the many advantages of Cooper gas engines for such service. Cooper engines are built in both horizontal and vertical types in standard sizes from 50 to 1500 B. H. P.

The Cooper-Bessemer Corporation

Mount Vernon, Ohio — Grove City, Pa.

1116 Magnolia Bldg., Dallas — 615 Kennedy Bldg., Tulsa
630 East 61st Street, Los Angeles, Cal.

Saleshots

(*Continued from Page 54*)

designed something along the lines of those shown here and feature each of the major appliances sold by the company. These mats are sent to the various stores or district managers in sets of six or more with instructions to use them either as space holders or as tie-ins to the various sales scheduled. The two advertisements reproduced here were sent out in ample time to be used with the sale of gas ranges in April and the next lot, featuring some other appliance to be sold during the following months, will be built along the same lines and sent out at least thirty days before the sale is actually staged. This ensures that there will be no space holders run that do not give the company a tie-in with an appliance that they are actually featuring, while at the same time it affords the local man an opportunity to follow up his campaign or sales ads with smaller ads featuring appliances he actually wishes to put over. These advertisements also may be regarded as new business ads for in all of them the service and easy plan of payment are played up.

A Gas Range for the Bride

By W. B. Stoddard

THE June Bride of 1929 is a thoroughly up-to-date young person, and she wants the most modern and efficient household equipment. The chances are that she has taken a course in domestic science, and is thoroughly familiar with the convenience of gas, so the dealer in making his appeal will have little difficulty in convincing all prospective brides that they need a gas range. The only thing necessary for the company to do, then, is to prove that it has the range best suited to her needs.

With this thought in mind one gas company installed a window in which the most prominent feature was a huge cut-out of an oven heat control. This was mounted on a pedestal, with ribbons running to gas ranges at opposite ends of the window, while at the base, spread out on a low table, were a number of aluminum cooking utensils, with a card announcing that the six piece set would be given free with one of their cabinet oven ranges. Large framed cards beside the ranges called attention to their good points, one observing:

IT IS FOR YOU

This oven heat control dial takes the guess work out of cooking

New Kitchen Comfort for the Bride

while the other advised:

Now Is the Time to
MODERNIZE YOUR KITCHEN
during this Special Sale of
OVEN HEAT CONTROL GAS RANGES

One of the large western gas companies not only goes after the bride's trade, but sees to it that she is kept "sold" on the stove after she has purchased it. With this view they insert in their gas range June bride ad the suggestion:

TO THE BRIDE

When your honeymoon is over, come in to see Mrs. Jesse H. Lodge at our store. She will gladly talk with you regarding the science of cooking, the proper use of foods, and show you how to use the Therm-Estate.

Their three column ad showed a young woman in wedding veil, carrying a shower bouquet of roses, and advised:

THE IDEAL GIFT FOR THE JUNE BRIDE

All White Enamel Estate Gas Ranges
$160.00
Equipped with Therm-Estate

She will use her stove more than any other furnishing. It has much to do with her domestic happiness and peace of mind.

Then it should be a thoroughbred. The model illustrated is all white enameled, nickel trimmed, a beauty to make any bride happy and proud.

They closed by advising that it could be purchased on the deferred payment plan, with an initial payment of $5.00; and also called attention to other gas range models, ranging in price from $42.50 to $242.50.

The range must be picked out and installed ere the wedding bells ring out, and whether it is to be presented by mother and dad, or purchased by the young people themselves, much thought is given to securing the proper model. In order to call their range to the attention of the bride and all her friends and relatives, the Providence Gas Co., Providence, R. I., last May unveiled a striking window. There was a large black cardboard background, on which was traced in white a bride with flowing veil. A white satin runner covered the floor. Upon the grey enamel range, which occupied the foreground, was laid a bridal bouquet of white roses with long tulle and silken streamers, while to the top was fastened a big bow of white ribbon. Two cards of blue, lettered in white, with borders of pink, suggested:

Give Her a Modern Insulated Gas Range

and

The Bride's Special—Insulated Gas Range with semi-enamel finish and oven heat control.

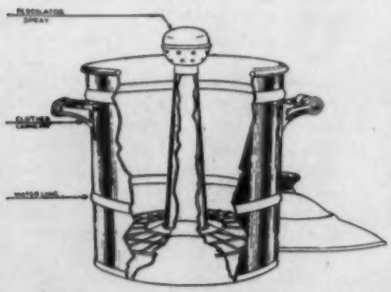
Beneath the stove, on a square of black velvet, was an open box of roses. The unusual stove setting caused all who passed to pause to observe more closely, and fixed firmly in their minds the close connection between brides and modern gas ranges.

Two Good Examples of Window-Trim Appealing to the June Bride

Equipment News

Perco Washer

Perco-Steril Machine Corporation, 22 East 41st St., New York City, have recently acquired the Perco Washer from the Mystic Washer Company. This latter organization had confined the distribution of the washer largely to a local territory in Texas.



The Perco Washer is entirely portable and depends for its heat on some external agency such as the gas stove or other heating device.

In operating the washer the clothes are thoroughly wetted in cold water for some time before being placed into the apparatus. A specified quantity of water is put into the washer together with soap dissolved in water and the laundry is spread out flat around the spout so as to cover the full service. The laundry is also pressed firmly down and successive layers are put into the washer to within about two inches of the top. The top of the washer is then put on and the apparatus is set over the top burner of a gas range or other heating device.

Percolation soon takes place and after it becomes steady it usually requires thirty minutes to complete the average washing. Of course, if the laundry is very much soiled it is recommended that percolation be continued after all dirt and foreign matter has settled on the bottom of the washer.

The water in percolating rises in the central spout where it comes into contact with a ball in the globular perforated header. This ball oscillates about in an irregular fashion and gives a diversity to the soapy water sprayed on the clothes being washed. The cycle continues by way of the soapy water seeping through the laundry and thence to the bottom of the central spout and up the same to the header again.

It is stated that evaporation is negligible and after the washing process has proceeded to a certain point the gas flame can be lowered.

The Perco Washer comes in two sizes, with capacities of 7 lbs. and 16 lbs. of dry wash respectively. It is made of heavy gauge copper lined with tin. Wooden handles are provided so as to make comfortable the handling of the washer while in a heated condition.

An outstanding advantage claimed for this device is its universal portability as well as its economy of fuel consumption.

Additional information on request.

Gas Research Develops Modern Brass Melting Furnace of Radically New Type

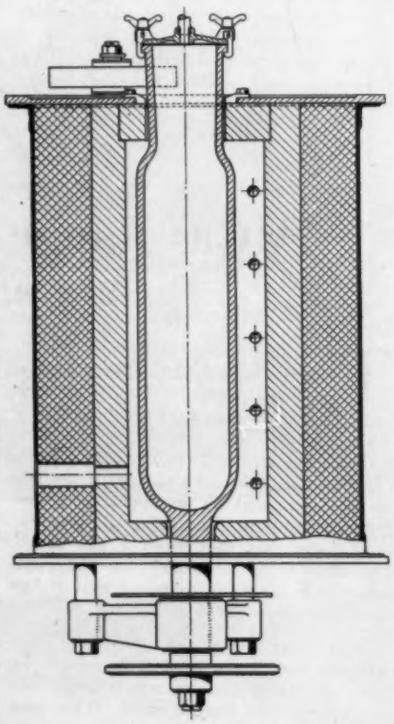
Alexander Forward, Managing Director, American Gas Association, has recently described an epoch making development in brass melting by way of a radically new type of furnace. His comments follow:

Through cooperative research, sponsored by the American Gas Association, there has recently been developed a radically new type of brass furnace, which through its greatly improved efficiencies including decreased fuel, maintenance and labor costs, reduced metal loss, increased output and improved castings, bids fair to revolutionize the brass foundry industry. For the first time in the history of the brass industry the short lived crucible and refractory lined furnaces have been supplanted with a retort of special alloy metal apparently of indefinite life.

Furthermore, foundrymen have never before known how to avoid the great loss of metal in brass melting, nor the heavy cost of crucible maintenance, and have been at a loss as to the most economical fuel to use. In many types of furnaces metal losses during operation equal or exceed the cost of fuel, whether gas, oil or coke.

New brass melting furnace in its shop location

The development of a metal alloy that would withstand working temperatures in excess of 2000 deg. F., repeatedly, in contact with molten metal, was a part of the research program, and while crucibles have a life of only about 15 or 20 heats, a single retort made from the alloy finally produced has already served for more than 250 heats and is none the worse for wear. The research in connection with the development of this equipment was done under contract between the American Gas Association and the American Gas Furnace Company of Elizabeth, N. J.



Cross-section view of new brass Melting furnace

This new brass melter consists of a revolving metallic retort externally fired and enclosed in a shell heavily insulated and refractory lined for heat concentration, atmospheric control and fuel conservation. The insulated sheet steel drum or shell is mounted on two bearings so that it can be tilted at any desired angle. Ten gas burners, five on each side, are mounted on this drum in such a manner that they fire into its interior. Within the drum is the special alloy metal retort so mounted that it revolves with a motor and variable chain and gear drive.

Air under pressure for combustion is supplied to the gas lines serving the burners and the gas-air mixture can be so regulated as to provide any desired atmosphere—oxidizing, reducing or neutral, within the combustion chamber, which is the space between the shell and the retort. In this case a slightly reducing atmosphere is maintained so as to prevent oxidation of the retort.

A thermocouple projects into the combustion chamber and is connected with a temperature control and recording pyrometer. Thus, the temperature of the furnace is maintained automatically, regard-

less of the operations of pouring and recharging.

The first of these to be used in commercial practice was installed at the plant of the Trenton Brass & Machine Company, Trenton, N. J. The various articles here are cast from commercial bronze and yellow brass in the melting furnaces and poured direct.

It was fortunate that this particular foundry was the first to try out the new gas furnace for besides being one of the oldest, most progressive and best managed foundries, it had used every kind of fuel and energy and every type of brass melting furnace in an effort, prolonged over many years, to reduce melting costs to a minimum and obtain the best possible control over its foundry practice and the final quality of its castings.

Prior to the innovation of the new gas melter coke fired pit furnaces, gas fired furnaces and electric furnaces had been rigidly tried and discarded, and the oil fired crucible furnace had been standardized upon.

Working Conditions Comparable

There are twelve of these crucible furnaces located at one end of the foundry in three rows, and inasmuch as they represent the best foundry practice which the management of this concern has been able to effect over a long period of many years, they afford a most valuable yardstick with which to measure the economies of the new gas melter. Furthermore, the same foundry practice is used with both so there is no chance for variables to enter.

The practice is as follows;—the flasks are made up on air molding machines, 16 in number, arranged along one side wall, and the pouring floor occupies that part of the room immediately adjacent. At the other end of this pouring floor and line of molding machines is a circular pouring unit consisting of two small and parallel steel rails, about six inches apart and a foot above the floor, forming a circular enclosed track, approximately 32 feet in diameter. Within the circle are four mechanical molding machines and after the flasks are made up on these they are transferred to the tracks where they remain stationary during the pouring and cooling.

Fume Exhauster

The principal feature of this pouring unit is an exhauster for the zinc oxide fumes, consisting of a post in the center which carries an overhead pipe to a point directly over the track and to which is fitted a hood. In addition there is a chain the crucible at any desired height or position above the flasks, and while pouring the fumes are kept within the hood and exhausted through an extension of the pipe through the roof.

This exhauster rotates with the center post so as to cover the entire circumference of the circular track. From 500 to 600 flasks can be made up and poured on this unit daily. Both this unit and the conventional pouring section are served with an overhead monorail system direct from the melting furnaces. With this system of handling a pouring schedule very closely synchronizing with the heats is possible.

Exclusion of Metal Losses

Probably the greatest service rendered by this new gas furnace, aside from the elimination of crucible and refractory maintenance and remarkably low fuel consumption, is the exclusion of metal losses through volatilization and oxidation while the charge is being melted. With the best practice that can be obtained with the crucible, the volatilization losses run between five and six per cent and each crucible, as it is pulled from the furnace, has to go on the skimming table and be skimmed of the oxidized metal before it can be taken to the pouring floor.

Almost all of the composition used in the castings here is a yellow brass containing 72% copper, 1½% tin, 1½% lead and the remainder approximately 25%, is zinc. The zinc has a very much lower melting point than the copper and when melted in the presence of air, volatilizes readily causing a very material loss of zinc from the original charge. Consequently the resulting castings vary in chemical analysis from heat to heat, day to day and month to month. To eliminate this and the oxidation loss the retort of the gas melter is fitted with an airtight cover which is bolted on securely.

When a new charge is put in certain gases are given off of which the retort must be relieved, and this is accomplished through a short pipe which is a part of the cover. As soon as these gases start to form, they are lighted and allowed to burn at the end of this pipe. In a few minutes they are exhausted, the flame extinguished and the operator thereby knows that it is time to screw the airtight cap onto the end of the pipe, thus sealing the entire retort charge from the outside atmosphere.

With this method of melting the only losses are during the pouring operation and are so minimized that there is hardly any variation in the chemical analysis of the resulting castings. Furthermore a more homogeneous casting is produced and one that is more easily machined than those made from crucible metal and at the same time the physical characteristics remain unchanged.

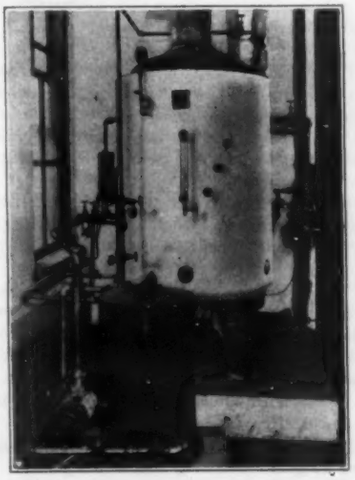
Low Fuel Consumption

The astoundingly low fuel consumption of 2½ cu. ft. of gas per pound of brass melted is one of the principal achievements of this furnace. Other economies effected include a considerable labor saving and faster heat transfer which reduces the melting time and assists in lowering the fuel requirements. There is still another appreciable fuel saving from the fact that 800 degrees of heat remain in the retort in the morning (except Monday). Inasmuch as this gas furnace is smokeless, fumeless, noiseless and gives off only a small amount of heat, the working conditions of the foundry are much improved.

Lattner Electric Condensation Pump

The P. M. Lattner Mfg. Co., Cedar Rapids, Ia., have issued a bulletin describing the Lattner Electric Condensation Pumps. The cut shows an installation of a 15 H.P. Lattner boiler and a Model 4 condensation return unit.

The receiving tank, being vented, offers no resistance to the condensation and make-up water, both of which are fed to the tank. Condensation water from the steam equipment is thrown into the tank by ordinary discharge traps. An internal float in the tank coupled to a valve in the side of the tank allows city water to enter automatically when the condensation water is not sufficient to keep the tank supplied.



The Electric pump takes water from the tank and pumps it into the boiler. The Lattner Mercury Switch Float Control mounted on the boiler, controls the electric pump, maintaining a normal water level in the boiler.

It also supplies the boiler with make-up water from the city supply, thus eliminating the need of other water feeding equipment.

A copy of the bulletin will be mailed on request.

Company Plans Gas School

Details concerning the new plant school for employes of the Northern Indiana Public Service Company were given out at a recent meeting of the Nipsco Club. J. J. Bosonitz outlined the course which is to be held at the gas plant auditorium. All branches of the gas industry are to be studied. There is to be no charge for enrollment or textbooks.

The Law of Gas Franchises

By Leo T. Parker

THE words franchise, privilege, consent, grant, and the like are used synonymously. Each word may have the identical legal meaning of any of the others, providing such is the intentions of the interested parties to the expressed or implied contract containing the expression.

A valid exclusive franchise conveys to the contractee, the gas company, a monopoly to carry on and transact its business free from competition in a restricted area.

When Franchise Is Exclusive

It is well established that a franchise granting an exclusive privilege to a corporation to supply a municipality with gas for domestic and public purposes for a *reasonable* period is valid, provided the grant originates from an authoritative source, or a State legislature. (172 U. S. 1).

On the other hand, it is well settled that the Courts never presume that the word "exclusive" was intended to be included in an ordinance granting a franchise to a company to supply gas to the inhabitants of the municipality.

In other words, the Courts construe the meaning of franchise ordinances strictly in accordance with language used therein.

Moreover, this is true although the gas company officials believe the corporation possesses an exclusive franchise and proceeds to perform certain acts and make improvements which it would not ordinarily make without belief that its operations are protected against competition.

For illustration, in the recent leading case (299 S. W. 355), the Court said:

"When a corporation alleges that the state or council have surrendered its power of improvement and public accommodation, abandonment ought not to be presumed in a case in which the deliberate purpose of the state of council do not appear."

In this case the Court held a subsequent ordinance valid which granted rights to a competitive corporation to supply gas to the inhabitants, in face of the fact that the original gas company had for many years paid to the municipal corporation a percentage of its profits and had supplied gas, without charge, to the municipal buildings believing such payment was made in consideration of its having an exclusive franchise.

Therefore, it is quite apparent that all grants, intended to convey exclusive franchise rights, should contain language formulated to clearly and unmistakenly indicate the intention of the grantors.

It is well established that if a municipality has power to grant a franchise, and a gas company installs equipment in good faith without having a franchise, *but by authority of the municipality*, the latter may be denied the privilege to question the right to use the streets, providing the use of the streets for this purpose does not violate statutory or charter requirements.

In other words, generally a municipality cannot successfully contest the right of a gas corporation to continue operation of its business, where the former has acquiesed for many years in the use of its streets by the company and the inhabitants have received the benefits of the use.

Also, the law has been deemed equally as firmly established that if a gas company spends a considerable sum on laying pipes and making other improvements to extend its service, it acquires a right *equivalent* to a franchise.

For example, in the leading case of City v. Citizens, 166 U. S. 557, in discussing this subject, the Supreme Court of the United States in effect said:

"All that is necessary for a public service company to retain its rights is to show that, upon the faith of a certain action on the part of the city, which it had power to take, the company incurred a new liability; as, for example, by the negotiation of a new loan, and the issue of a new bond and mortgage to secure the same."

Also, in the leading case of Clear Creek Oil & Gas Co. v. Ft. Smith Smelter Co., 148 Ark. 260, it was held that a corporation, organized under a statute for the purpose of marketing gas, had a right to maintain its lines of pipes for that purpose along the public highways and the streets of cities with the consent of the authorities thereof and that, by complying with the statute as to its organization, the corporation would acquire the right to extend its pipe lines and supply private customers, irrespective whether or not a franchise had been granted.

Charter Granted

However, it is important to observe that the recent case of Natural Gas Corporation v. Norphlet Gas & Water Co., 294 S. W. 53, importantly affects a variation of the law on this subject. In this case, it was disclosed that a charter was granted to Natural Gas Corporation by the state of Arkansas on the 11th day of April, 1922. By the terms of the charter, the corporation was given power to establish, construct, and operate pipe lines and other appurtenances for distributing and marketing gas. It was, also, given the power to distribute and deliver such products through its own pipe lines and other appurtenances suitable for that purpose, and "to purchase, lease, or contract for all such machinery or property as might be incident and necessary to any of the objects granted."

Pursuant to the provisions of its charter, it obtained an easement or right of way to lay its mains in the village of Norphlet *before it was incorporated as a town.*

When gas and oil were discovered in that territory, the village of Norphlet greatly increased in population and the gas company extended its mains. At this time, it had expended about $20,000 in laying out mains and installing other equipment.

After the town of Norphlet was incorporated, its council passed an ordinance granting an exclusive franchise to a competitive corporation, the Norphlet Gas & Water Co., for a period of twenty-five years. The latter company proceeded to expend a large amount in laying pipes and installing equipment.

Immediately thereafter, the Norphlet Gas & Water Company instituted legal proceedings to prevent the Natural Gas Corporation from supplying its product to the inhabitants of Norphlet, on the grounds that since the latter company had no exclusive privilege to serve the inhabitants of the town, the exclusive franchise automatically terminated the acquired common law right of the latter corporation.

Important Question

Therefore, the question presented to the Court was: Did the passage of the ordinance granting exclusive privileges to the Norphlet Gas & Water Company supercede and invalidate the natural or common law right acquired by the Natural Gas Corporation?

It is interesting to observe that the Court held the ordinance void, because of irregularities in its passage by the Council, but indicated that the town of Norphlet had a legal right to prevent the Natural Gas Corporation from further serving the inhabitants by passing a valid ordinance giving the Norphlet Gas & Water Company an exclusive franchise. This higher Court said:

"The only way, it seems to me, that the town of Norphlet could take away the right of the defendant Natural Gas Corporation to furnish the inhabitants of the town of Norphlet . . . would be to pass a valid franchise to some other company, giving it the exclusive right to furnish the inhabitants. . . . This would take away the right of defendant, because it has no exclusive right, and has no franchise right for any particular length of time."

It is therefore, quite apparent that a gas company may lose its rights, acquired by an invalid ordinance, to serve the public. Furthermore a gas company which expends money in laying pipes in an *unincorporated town* may lose its rights to serve the public if, when the town is incorporated, the council possesses an ordinance granting an exclusive franchise to another company.

Obviously, all public utility corpora-

tions are under the control of properly created and authorized commissions, so long as the public service of such corporations is continued.

Moreover, this is true irrespective whether the corporation possesses a franchise to transact its business, the important consideration being whether its operations are legal, and for public benefit.

For example, in a very recent case (49 S. Ct. 150), the Supreme Court of the United States held a gas company under the jurisdiction of the state public utility commission, although the corporation's franchise had expired many years previously. Since the gas company had continued to serve the public, after expiration of its franchise, it was decided that its legal relation remained the same, and it was denied the right to remove its property and discontinue its service, although the rates established by the commission were quite unsatisfactory.

Franchise Not Altered by Subsequent Laws

Generally speaking, the terms of a valid franchise are not varied by subsequent laws.

For instance, in Village of Warsaw v. Pavilion Natural Gas Co., 190 N. Y. S. 79, it was shown that a city granted to a gas company a franchise for supplying natural gas to its inhabitants. The gas company agreed that it would not charge more than 40 cents per 1,000 cubic feet for the gas.

The gas company proceeded to supply gas at this price for many years, when it filed a petition to the Public Service Commission for permission to increase its rates, based upon a law enacted ten years after its franchise was granted. However, the Court held the original terms of the franchise contract not varied by subsequent laws.

The Law Relating to Municipal Corporations

Municipal corporations are political subdivisions of the State, created as *convenient* agencies for exercising such of the governmental powers of the State as may be entrusted or delegated to them.

For the purpose of exercising these powers properly and efficiently the State delegates to the municipalities the power to acquire, hold and manage personal and real property. The number, nature and duration of the powers conferred upon the municipal corporations, and the territory over which they shall be exercised, is within the absolute discretion of the State to designate.

Also, it is important to know that neither a municipality's charter, nor any law conferring governmental powers, or vesting in them property to be used for governmental purposes, or authorizing them to hold or manage such property, or exempting them from taxation upon it, constitutes a contract with the State within the meaning of the Federal Constitution.

For example, in City of Pawhuska v. Pawhuska Oil and Gas Co., 250 U. S. 395, it was disclosed that at the time a city granted a franchise to a gas company, to use the streets and supply gas to the city and its inhabitants, the city alone had authority to regulate the charges and service thereunder within its municipal limits.

Later the State enacted a law transferring this right to a commission which granted a request of the gas company to increase its rates. The city contended that this later law, which took power from it and delegated the same to the commission, was invalid because it impaired the contract made with the gas company. However, the Court held otherwise, saying:

"The contention of the city was that the authority to regulate the rates and service, which concededly was reserved at the time the franchise was granted, was irrevocably delegated to the city by the constitution and laws of the state and therefore that the exertion of that authority by any other state agency, even though in conformity with a later enactment of the legislature, operated as an impairment of the franchise contract . . . the municipality, being a mere agent of the state, stands in its governmental or public character in *no* contract relation with its sovereign, at whose pleasure its charter may be amended, changed or revoked, without the impairment of any constitutional obligation, while with respect to its private or proprietary rights and interests it may be entitled to the constitutional protection."

Obligated by Orders

Moreover, the circumstances may exist under which a gas company is obligated by orders issued by a Public Utilities Commission created by a state law enacted *after* the gas franchise was granted.

For instance, in City of Billings v. Billings Gas Co., 173 Pac. 799, it was shown that the city council of Billings, Montana, by ordinance granted to W. B. Snyder, his successors and assigns, the right to lay gas mains and pipes in the streets, avenues, and alleys and supply the inhabitants with gas. The ordinance fixed a maximum rate to be charged during the first two years, and provided that thereafter such rate should be reduced from time to time as the total annual consumption of gas increased to certain stated amounts. The terms of the ordinance were accepted, and the Gas company, succeeding to Snyder's interests, installed the plant and commenced operations.

Sometime later, the Legislature passed an act, creating the Public Utilities Commission and defining its duties and powers. Immediately thereafter the gas company filed with the commission its schedule of rates then in force, and this schedule was approved. A few years later the total amount of gas sold by the company reached 30,000,000 cubic feet, and by the terms of the ordinance it was required to reduce its rates from $1.80 per 1,000 cubic feet, to $1.50 per 1,000 cubic feet. However, the company refused to make the reduction, and the city filed suit to compel the gas company to reduce its rates.

However, the Court permitted the company to continue charging the same rate, on presentation of facts showing justification, saying:

"A city of this state has only such authority as is conferred upon it by express legislature declaration or by necessary implication and any doubt as to the existence of a particular power will be resolved *against the city*, and the right to exercise the power denied."

On the other hand, a gas company, not a public utility, cannot impair the obligations of its contracts to furnish gas, by subsequently engaging in the operation of a business subject to the state's control.

For illustration, in Clear Gas Co. v. Spelter Co., 230 S. W. 897, a company was organized for the purpose of sinking wells, and transporting crude oil and natural gas, and any other minerals which may be found in the development of its property.

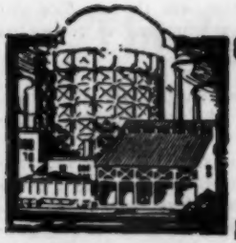
Assuming itself to be a Public Utility the gas company, several years later, filed its petition before the State Corporation Commission asking that a new schedule of rates for the use of gas by smelters and other like consumers be fixed at 10 cents per 1,000 cubic feet.

However the Court held the gas company not within the jurisdiction of the commission with respect to its private contracts, saying:

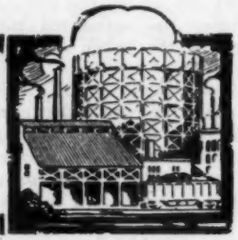
"If appellant (gas company) was not a public utility at the time these contracts were entered into, and the contracts were not entered into *in anticipation* of the company becoming such a public utility, but were merely private undertakings concerning a subject-matter, then such contracts were valid, and the obligations thereof could not be impaired by any state regulation."

Per Capita Gas Demand in Connecticut Hits High Mark

Average consumption of manufactured gas in Connecticut far exceeds the average use of that fuel throughout the United States. According to statistics based on the present population of the United States and of Connecticut, as estimated by the United States Census Bureau, per capita use of gas in Connecticut exceeds by 1,600 cubic feet its average use by each individual throughout the nation. The present rate of gas used in Connecticut is about 5,500 cubic feet per person per year, while the country as a whole consumed 3,900 cubic feet of manufactured gas for each person during the past year. Although Connecticut has less than 1.4 per cent of the population of the United States, more than 1.8 per cent of the gas manufactured within the nation's boundaries is consumed in the state.



NEWS OF THE GAS INDUSTRY



Central Public Service Makes Office Arrangements in Atlanta

District offices for the properties owned by the Central Public Service corporation in the South as well as main offices for the Atlanta Gas Light company will be established at Peachtree and Harris streets, Atlanta, Ga.

The former Buick building there has been leased by the Central Public Service corporation for a period of 20 years at an aggregate rental of $500,000, and $100,000 will be spent at once on renovations and improvements, it is announced. In addition to a large display room, facilities for the payment of gas bills will be included on the main floor, while the remainder of the building, which is four stories high, will be given over to offices.

In addition to the central office branch offices will be established in various parts of Atlanta for the convenience of customers in paying gas bills.

Headquarters for twenty-six gas companies acquired by the Central Public Service corporation in the South will be maintained in Atlanta, the list of states including Georgia, Alabama, Tennessee, Florida, North Carolina, South Carolina, Mississippi, Louisiana and Texas.

The Peachtree offices are expected to be ready for occupancy about May 1, at which time control of the Atlanta Gas Light company will be assumed.

Transporting Gas Long Distaxces in Connecticut

Long distance high pressure transmission of gas has become a reality in Connecticut.

Probably the largest system of its kind in the East was completed recently when a pipe line originating in the Connecticut Coke Company's plant in New Haven was put into commission to serve gas to New Haven, Meriden, Bristol, Plainville, Middletown, Cromwell and Hartford.

The gas plants in the cities named are owned or controlled by the Connecticut Light and Power Company and it is believed that the plants located in Meriden, Bristol and Middletown have been shut down and will be dismantled.

High pressure gas, averaging 30 pounds pressure is distributed through a steel pipe line made up of 16, 12, 8 and 6 inch pipe. The pipe line has a total length of approximately 60 miles and parallels a 6 inch main for a distance of four miles between Wallingford and Tracy.

Convention Calendar

May

6-9 Convention, Natural Gas Department, American Gas Association, Kansas City, Mo.

6-11 Exposition of Chemical Industries, Grand Central Palace, New York City.

27-29 Production Conference, Technical Section, American Gas Association, Baltimore, Md.

June

3-6 National Association of Purchasing Agents. Annual Convention, Hotel Statler, Buffalo, N. Y. B. W. Hall, Asst. Sec., 11 Park Place, New York.

13-14 Canadian Gas Association, Annual Convention, Ottawa, Ontario. G. W. Allen, Secretary, 7 Astley Ave., Toronto.

17-29 Fourth Short Course in Gas Engineering, University of Illinois. George Schwaner, 205 Illinois Mine Workers Building, Springfield, Ill.

July

1-3 Michigan Gas Association Annual Meeting, Grand Hotel, Mackinac Island, Mich. Albert G. Schroeder, Grand Rapids, secretary.

Gas Permit Issued

The public utilities commission in accordance with the vote of the citizens of Littleton, Colorado, granted the Public Service Company of Colorado privilege to serve the city of Littleton with natural gas for twenty years, but refused to sanction the company's plea that the rate to be charged be made part of the contract, the commission stating that a change of rates might be necessary in the future. Littleton is not a home-rule city, therefore the commission has full jurisdiction. The gas to be served will connect with the Denver-Amarillo pipe line which passes alongside.

Pacific Lighting Stock Offered Employees

Employees of the Corporation were recently given the opportunity of buying the Common Stock of Pacific Lighting Corporation "over the counter" on the installment plan. The Management of Pacific Lighting allotted a number of shares to the employees of Los Angeles Gas and Electric Corporation, Southern Counties Gas Company, and other allied utilities, on the basis of $70 per share and on terms of $2 per share per month. This offer was open only to those who had been in the service one year or longer and expired March 15.

No interest will be paid on monthly payments nor charged on unpaid installments, nor will the subscriber receive any dividends until the price of the stock has been fully paid. However, rights to subscribe for additional stock will be issued to subscribers on the same basis as to other stockholders.

Pacific Lighting Corporation is the holding company for Los Angeles Gas and Electric Corporation, Southern Counties Gas Company, Santa Maria Gas Company, Southwestern Gas and Fuel Company, Turlock Gas Company, Madera Gas Company, and Industrial Fuel Supply Company. It owns all the common stock of our own Corporation.

Commission Decision Regarding Sale of Natural Gas

A decision of first importance to the gas industries of the state of Texas, which has been awaited with keen interest by oil and gas men of this state, was handed down by Attorney General, Claude A. Pollard, recently.

The question involved was whether or not the Railroad Commission, which has supervision over pipe lines, could compel a gas pipeline company to furnish gas to a distributing company in towns adjacent to the pipeline. The case was that of L. F. Troxel of Lubbock, who has a series of pipes laid in Lufkin and a connecting main to the pipeline of the Dixie Gulf Gas Company. Troxel was granted a franchise to furnish gas to residents of Lufkin in preference to the Dixie company. The Dixie company now flatly refuses to furnish the gas to Troxel's mains. Troxel appealed to the Railroad Commission, and the commission put the problem up to the Attorney General with the above-named decision.

With the power of thus regulating the sale and distribution of gas in their hands, it is generally believed that the commission will order the Dixie company to furnish gas to Troxel. The Dixie company has indicated, however, that they will carry the case into the courts and demand a legal decision from a high court before acceding to the demands of the commission.

Gas Consumption in Southern California

Gas consumption in Southern California during 1928 for industrial and domestic purposes increased approximately six and one-half percent over the 1927 total, based upon production figures recently compiled by Southern California Gas Company, Los Angeles Gas & Electric Corporation, and Southern Counties Gas Company. These three leading gas utilities of Southern California handled a combined total of 96,718,706,000 cubic feet of gas, as compared with 90,869,648,000 cubic feet in 1927, an increase of 5,849,058,000. The combined number of meters installed at the close of the year aggregated 715,486, as compared to 680,794 at the end of 1927, a net increase of 34,692, or more than five percent.

Southern California Gas Company's production increased over 4,000,000,000 cubic feet, or six and one-half percent, to bring the year's total to 65,000,000,000 cubic feet. Southern Counties Gas Company increased their output by nearly 1,000,000,000 cubic feet, or eight percent, to establish a figure of more than 13,000,000,000 cubic feet. The two organizations laid a combined total of 468 miles of new main during the year, of which more than 300 miles went into the Southern's system, to bring the total miles of mains for both companies up to 6869.

Thomas J. Reynolds, Vice-President and General Counsel, Southern California Gas Company, was recently elected to the presidency of the Community Industries. Two additional buildings located near the present quarters of the Industries have been acquired and will provide dormitory facilities for workers employed in the workshops.

Mayor of Little Rock Compliments Gas Service

In a Year Book containing reports of the Mayor and City officials of the city of Little Rock, Ark., prepared for submission to the City Council of that city, Charles E. Moyer, Mayor, is very complimentary in his remarks about the excellent gas service Little Rock has enjoyed the past winter.

The Arkansas Natural Gas Corporation, a Cities Service Company, with headquarters at Shreveport, for the past year has served natural gas to Little Rock, and just recently purchased the distribution system in that city from the Dawes interests, at the same time the Gas Service Company purchased the Jackson County Light, Heat and Power Company at Independence.

In his report, Mayor Moyer speaks of the excellent gas supply Little Rock now has, and states: "We have had very low temperatures this winter, and not one complaint of inadequate gas has reached my office."

Mohawk Hudson Power Corp. Elects Directors

The following have been elected directors of the Mohawk Hudson Power Corporation at the annual meeting of the company held at Albany:

Roger W. Babson, Wellesley Hills, Mass.; Nicholas F. Brady, New York City; Charles S. Brewer, Albany; Floyd L. Carlisle, New York City; John N. Carlisle, Watertown; Bernard C. Cobb, New York City; Arthur V. Davis, Pittsburgh, Pa.; Frederic J. Fuller, New York City; George H. Howard, New York City; James T. Hutchings, Philadelphia, Pa.; William E. Lewis, Utica, Edward Murphy, Troy; Robert C. Pruyn, Albany; Charles B. Rogers, Utica, Charles S. Ruffner, Albany; R. A. C. Smith, New York City; William I. Tabor, Utica; F. M. Tait Dayton, Ohio; Owen D. Young, New York City; John E. Zimmerman, Philadelphia, Pa.

The number of directors of the Company was reduced from 25 to 20 by vote of the stockholders.

South Bend to Have Fine Utility Building

Definite plans for the construction of a three-story building to house the Northern Indiana Public Service Company were made public by Guy M. Johnson, district manager. The cost of the proposed building is estimated at $155,000.

Work is scheduled to begin about July 1 with completion date set early next spring.

The building will have a frontage of 66 feet and a depth of 89 feet and although present plans call for only a three story building all structural design will be planned to permit the addition of two more stories. The new service building will be of structural steel and concrete construction with side walls of fire proof brick and the front of the building will be faced with Indiana limestone. The total volume will be approximately 265,000 cubic feet or about twice as much space as occupied by the present departments which will make use of the new facilities. In addition to a commodious sales room a cashier's counter and order desk will occupy the first floor. On the second floor will be the commercial department and the office of the district manager while on the third floor will be installed the engineering department rooms and rest and recreation rooms. In the basement will be located the salesmen's rooms, headquarters for meter readers, additional display rooms as well as lavatories and showers for employes.

The new building will be used exclusively by the Northern Indiana Public Service.

Joliet Has Commodious New Quarters

The Western United Gas and Electric company has commodious quarters in the new Public Service Company's new building opened in Joliet last week. The gas company is serving 18,500 patrons in Joliet and the immediate vicinity while gas produced at the Coal Products plant on North Broadway goes to 70 communities. Last year the company produced 3,750,000,000 cubic feet of gas at the plant. W. J. Murdock is district manager for the company.

Employees Merit McCarter Awards

Robert Ruffini, head coke screen operator at The Astoria Light, Heat and Power Company, New York, a few months ago resuscitated a man who had attempted suicide by inhaling gas for which he has been awarded the McCarter Medal.

Fitter John York, of the 66th Street Customers' Service Department, last October successfully resuscitated a young woman who had attempted suicide by gas. Mr. York has been awarded a McCarter Medal.

Other employees who received McCarter awards at this time are Miss Elizabeth J. Fleming of the 57th Street District Office, a McCarter Medal, and Mr. Thomas Hallinan of the 66th Street Shop, a Certificate.

Gas Employes Set World's Record; Insurance Goes Over 99%

Peoples Gas, Light & Coke Company employes again demonstrated their opinion of the value of life insurance and set a new high industrial record for the world, when 99 of a possible 100 per cent of those eligible subscribed for additional insurance.

This is 1.3 per cent higher than the record of last year, which was 97.7 per cent. This latter figure, according to Aetna Life Insurance Company officials, was the highest participation in this class of insurance, of any company in the world. The new record boosts the standing even higher.

Only 8 of the 65 departments or divisions of the company were less than 100 per cent. They were: Home Service—63.6; Statistical—66.7; Filing—83.3; Power Plant—94.4; General Service—94.6; Central Storehouse—94.8; Peoples Gas Stores—95.5; Local Storerooms—96.2. It is expected that some of these percentages will be pulled up in the near future.

Of the 3,639 employes eligible to participate only 35 did not do so. A total of 3,604 employes have doubled the insurance given to them by the company Christmas time.

Insurance, varying in amounts according to the lengths of service, is presented by the company annually as a Christmas present. Employes holding this insurance are allowed to subscribe for a like additional amount at an extremely low rate which averages only $10.96 per thousand.

Gas Helps Clean Clothes

The new Community Laundry of Hollywood, California, costing $750,000, is recognized as one of the finest equipped and most modern plants on the Pacific Coast. This business started only five years ago with 25 employees and handled 10,000 pieces its first week. The new plant employs 400 people and launders 200,000 pieces daily. Gas-fired steam boilers of 400 horsepower capacity help make this possible.

Natural Gas Stock Transaction

The holders of common stock of the Arkansas Natural Gas Company, a subsidiary of the Cities Service Company, on record as of April 16 will be privileged to subscribe for class A common stock at $4 a share, at the rate of one share of the A for each four shares held. The A stock has the same standing as the common stock, with the exception that it is non-voting.

Seaboard Public Service Company Organized

The Seaboard Public Service Company has recently been organized to facilitate administration of operating companies in the southeastern territory.

The new organization will serve 509 communities located in seven states along the Atlantic Coast, and includes the following operating companies: Virginia Public Service Company, Eastern Shore Public Service Company, Tide Water Power Company, Georgia Power and Light Company, Florida West Coast Ice Company and Florida Power Corporation.

Offices of the new company will be located in the new building which the Virginia Public Service Company will erect in Alexandria.

Traverse City Now Operating Under Interstate Management

The fourteenth addition to the Interstate holdings began operations as a part of the Michigan Fuel and Light Company in March. Mr. A. P. Eva, local manager under the former ownership will continue as local manager.

Consolidated Gas Company of New York Has Exhibit at Architectural and Allies Arts Exhibition

The illustration herewith shows a portion of the booth which the Consolidated Gas Company of New York had at the recent Architectural and Allied Arts Exhibit at Grand Central Palace, New York.

It is interesting to note that only insulated appliances where shown and to assist this thought the Consolidated exhibit was constructed of cork and corrugated asbestos throughout. Large water color paintings showed the various gas appliance insulating operations.

Laying Main Underground

The four-inch gas main between Ames and Nevada, which the Iowa Railway and Light corporation has been using this winter to supply the latter city, and which was laid above ground, is being put underground. When the highway commission last fall acquired right-of-way to widen the road the corporation was required to move its main farther out and winter weather interrupted the underground work.

Plan Large Booster Station

A $600,000 gas booster station near Model, Colorado, which is in the vicinity of Pueblo, Colorado, are the plans of the Colorado Interstate Gas Company, owners of the Amarillo-Denver pipe line.

Essay Prizes Offered by P. C. G. A.

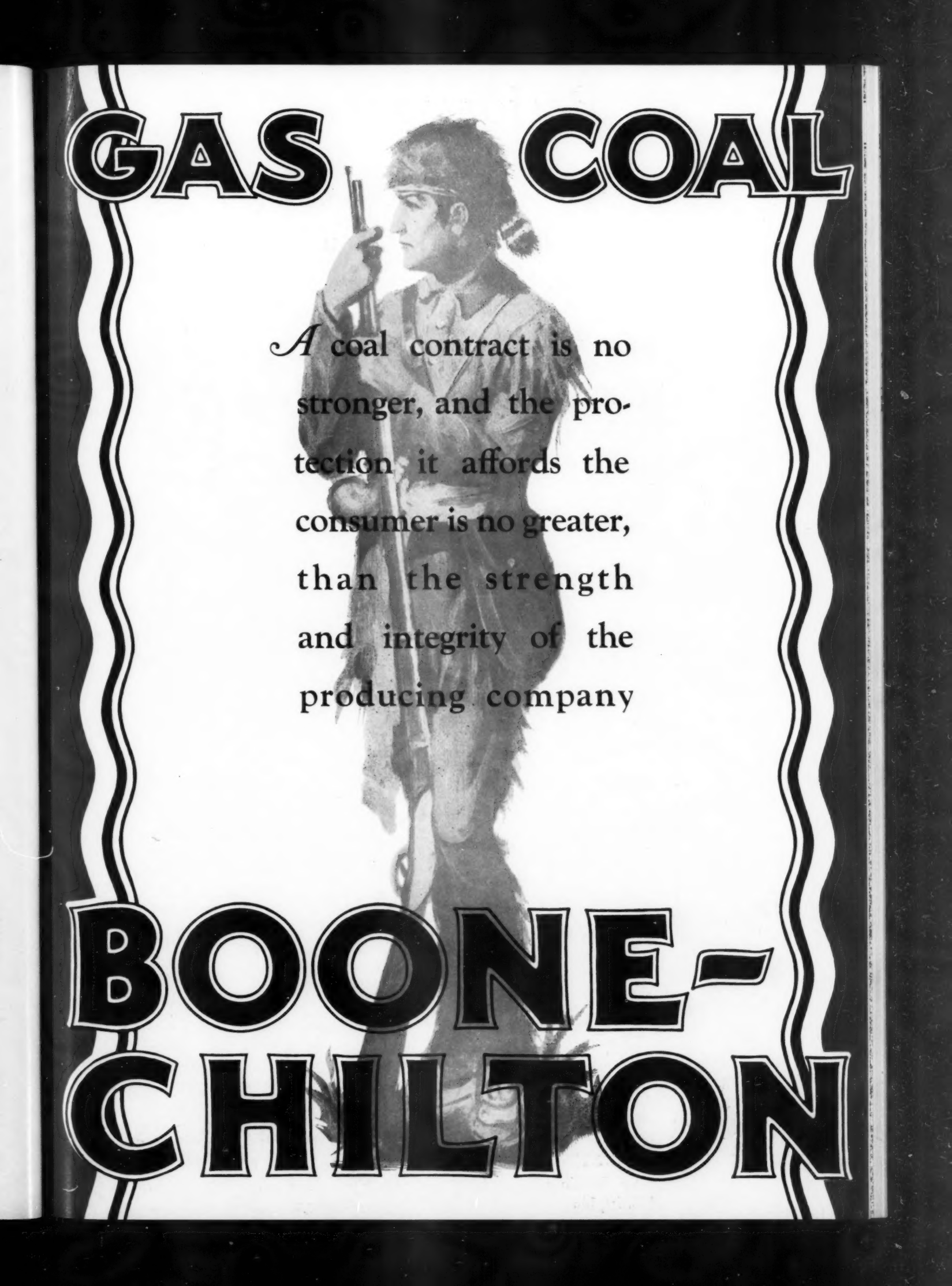
There is a good bit of initial enthusiasm being manifested regarding the forthcoming essay contest in the Pacific Coast Gas Association. The subject of the essay will be "Why Gas Is Better." Substantial prizes are being offered to those who are successful in producing the best essays.

New Indiana Gas Well

The Bement Gas Company of Petersburg, Ind., drilling on the James Fettinger lease six miles south of this city has brought in a new gas well at a depth of 1,070 feet with a volume of 500,000 cubic feet of gas a day. The gas will be used for providing Winslow and Petersburg with natural gas.

Grants Petition to Lay Mains

The city council recently took final action granting petition and franchise to the Northern Indiana Gas company to lay gas mains to serve the city of Attica, Ind., the council fixing September 1930 as final date for commencement of service. The company will bear all expense of mains up to the meter connection.


GAS COAL
A coal contract is no stronger, and the protection it affords the consumer is no greater, than the strength and integrity of the producing company
BOONE-CHILTON

Performance

Years of satisfactory contract fulfillment should be a safe guide to the future.

The Boone County Coal Corporation protects the coal supply of its gas customers by a reliable performance of its contracts.

Safeguard your coal supply
by a contract for

Water Gas
Coal Gas
By-product

Produced and sold
by Boone County
Coal Corporation

BOONE-CHILTON

GAS COALS

BOONE COUNTY COAL CORP. PHILADELPHIA-CHICAGO

450 Bullitt Building
Philadelphia

205 W. Wacker Drive
Chicago

Indiana Company Shows Increased Income

A net income of $3,076,302.11 for 1928 is reported in the annual financial statement of the Northern Indiana Public Service Company made public. The figures represent a substantial increase over the previous year when the net income was $2,734,901.53. The company supplies South Bend and Mishawaka with gas.

Petitions to Lay Pipe Line

The Northern Indiana Public Service Company has petitioned the town board of Williamsport, Ind., for a franchise to lay pipe lines and provide this city with gas service. It is proposed to lay a line here from Lafayette, Ind. The town board will act on the request some time this month.

Several Towns Will Hold Franchise Elections

A number of Oklahoma towns will soon vote on granting franchises to public utility companies. Among them are: Carnegie, May 14, gas, to State Fuel Supply Company; Bridgeport, Gage, May 6, gas, to William Horwitz; Fort Worth, Tex.; Avard, May 2, gas, and Quinlan, May 3, gas, to Winchester Oil & Gas Company.

Approves New Schedule

The Public Service Commission of New York has approved a new schedule of Central Hudson Gas & Electric Co. for gas service supplied in cities of Beacon, Kingston, Newburgh and Poughkeepsie, and suburbs. Schedule effective April 29, 1929, adds new classification applicable to use of service to bakeries on "off-peal" hours: from 8 p. m. to 6 a. m. Rate is 80c per M C F for all gas used within the above named hours and is based on a guaranteed consumption of 300,000 C. F. per year, used within said hours. For consumption between the hours of 6 a. m. and 8 p. m. the rate will be as stated in regular service classifications to which this rate is made supplemental. Minimum charge is the guarantee of 300,000 C. F. at 80c per M. C. F. prorated monthly, plus the minimum charge provided in the respective classifications under which customers take regular service.

Gas Engineering Course Advisory Board Holds Meeting

Members of the Advisory Board in connection with the Gas Engineering Course at The Johns Hopkins University Baltimore held their second meeting in New York Wednesday April tenth. This Board which was appointed by Dr. Frank J. Goodnow, President of the University, held its first meeting in Baltimore on February 22nd for the purpose of organizing. The members of the Advisory Board are: Chairman Walter R. Addicks, Senior Vice President of The Consolidated Gas Company of New York; Secretary Charles M. Cohn, Vice President of the Consolidated Gas Electric Light and Power Company of Baltimore; Howard Bruce, Chairman of Board, The Bartlett Hayward Company; P. H. Gadsden, Vice President, United Gas Improvement Company; H. B. Rust, President, The Koppers Company; H. S. Schutt, Vice President, C. H. Geist Company.

File Articles of Incorporation

Articles of incorporation have been filed with the secretary of state at Indianapolis by the Perry Oil & Gas Corporation of Tell City, Ind. The corporation has an initial capital stock of $15,000 and is formed "to buy and sell oil leases, drill and develop oil and gas wells." The incorporators are Herman H. Hagedorn, Thomas Mulholland, Henry Schlachter, Charles R. Schlachter, Louis J. Birchler, George Sabelhouse and Urdix B. Ewing.

Is It Helium Gas?

Chemists of the State Agricultural College of Manhattan, Kansas, are making tests of the gas flowing from the well of Dr. Sol Edgerton and C. M. Coleman near Alma, Waubaunsee county, Kansas, it being the impression that it has a helium content. The well is flowing one half million cubic feet daily.

Ripley Appointed Advertising Representative of American Gas Journal

We are glad to announce the appointment of Edwin F. Ripley as Eastern advertising representative of the American Gas Journal and American Gas Catalog with headquarters in New York. Mr. Ripley needs no introduction to the equipment and appliance manufacturers as he has been actively associated with them for the past eight years up to his resignation from the Robbins Publishing Company, January 1st, 1929.

Personals

J. Arnold Norcross, vice-president and and general manager of the New Haven Gas Light company has announced his retirement from that position to take effect June 1.

Mr. Norcross has been in the service of the Gas company for the past 26 years, coming to New Haven to take the position of engineer and superintendent, and subsequently became secretary and treasurer and later vice president and general manager. During the greater part of this period his uncle, the late Charles H. Nettleton, was president, succeeding the late Andrew W. DeForest.

Prior to his connection with the New Haven Gas company Mr. Norcross had a wide experience in gas works design, construction and operation in connection with the building of gas works in various countries abroad with the firm of Humphries & Glasgow, Ltd. Mr. Norcross' earliest training was with the Consolidated Gas company of New York.

The termination of Mr. Norcross' connection with the company will be a matter of much regret to the directors and to his many friends in New Haven. Following his retirement Mr. Norcross plans to take a long vacation, after which he may take up the work of consulting gas engineer. It is Mr. Norcross' intention to retain his residence in New Haven.

Henry A. Doering was recently promoted from the position of secretary to vice-president of Westchester, N. Y., Lighting Company. William L. Diehl, for several years secretary of the Bronx Gas and Electric Company, has been appointed to succeed him as secretary of the Westchester Company.

Another promotion announced at the time was that of Edwin North from the position of purchasing agent to that of assistant secretary and purchasing agent.

Mr. Doering has been affiliated with the gas and electric industries for about thirty years. He was employed by Westchester Lighting Company in July, 1899, as an office boy and occupied the position of indexer, collector, order clerk, bookkeeper, salesman, and in 1902 was promoted to superintendent of the New Rochelle District of the company, where he had general supervision of the commercial department as well as the construction and maintenance work of the company in the New Rochelle district. In 1920, Mr. Doering was appointed assistant secretary, a position he occupied until his promotion to the office of secretary of the company early in 1926.

Mr. Diehl entered the employ of the Consolidated Gas Company in 1904 as an indexer. He displayed marked ability and advanced rapidly through various departments, going to the Bronx Gas and Electric Company as secretary about four years ago.

Mr. North became affiliated with Westchester Lighting Company in 1926, after having been in the employ of the Consolidated Gas Company since 1897.

George B. Cortelyou was recently tendered a dinner in the council room of the University Club to celebrate the twentieth anniversary of his presidency of the Consolidated Gas Company of New York. The dinner was tendered by the executive officers and trustees of the Consolidated Gas Company and affiliated gas and electric companies.

Walter R. Addicks, Senior Vice-President of the Consolidated Gas Company,

was the presiding officer, and following a few remarks of tribute to Mr. Cortelyou and pointing out the development of the company during the administration of Mr. Cortelyou, other tributes were paid by a few of the diners. Mr. Addicks introduced Mr. John Stilwell, Junior Vice-President of the Consolidated, who presented Mr. Cortelyou with an ornamental clock. Among the diners were a number of men prominent in the gas industry.

Claude D. Zeigler of Jacksonville Gas Company, son of Mr. R. A. Zeigler Vice President and General Manager of that Company is now associated with Roberts and Mander Stove Company of Philadelphia in the capacity of Southern Sales representative for Quality Gas Ranges and Appliances—succeeding Mr. Charles L. Lyon who is now Manager of Southern Cities Public Service Co. Charleston, S. C. Plant.

J. E. Louiseau, secretary of the Public Service Company of Colorado who is general chairman of the airplane races to be started this summer, comes out now with the suggestion that Colorado should sign its scenic features, better road makers etc., and then the slogan: "A Sign A Mile" was hitched to the plea. The result is that the state highway department will hang the sign and bring joy to all tourists.

Edward C. Uhlig, Chief Chemist of The Brooklyn Union Gas Company, was given a testimonial dinner recently in recognition of his twenty-five years of continuous service with the company.

Clifford E. Paige, vice president of The Brooklyn Union Gas Company, in a eulogistic address, stressed the importance of chemistry in the gas business and spoke of the valuable services rendered by Mr. Uhlig in his quarter of a century of service, not alone to the Company but the gas industry as a whole.

Other prominent speakers, all complimenting the guest of honor on his record of accomplishments and service were Major Alexander Forward, managing director of the American Gas Association; F. C. Weber, assistant vice president of The Brooklyn Union Gas Company and W. Cullen Morris, vice president and chief engineer of the Consolidated Gas Company.

Since Mr. Uhlig's entrance into the gas business on April 4, 1904, he has become one of its most prominent figures. He is a member of many scientific societies and has served as chairman of several important committees of the American Gas Association.

The dinner was attended by the officials of various gas companies in Greater New York along with 150 of his friends in the Company.

F. B. Rothlisberger, an engineer of the St. Joseph Missouri Gas Company, has been temporarily transferred by Charles Koimm, chief engineer of the company to Madison, Kan. The Gas Service Company has already started the construction on a distribution system in that city and in Olpe, Kan. Mr. Rothlisberger will be in charge of this work under Ed. S. Miller, manager of the Western Distributing Company.

C. H. Beasenburg stood at the top with sales amounting to $25,570 to his credit for 1928.

The record shows that his success as an appliance salesman did not come in spurts, as he was highest in sales for every month during 1928 except two. Up to time of going to press Mr. Beasenburg is maintaining his lead, which indicates that nothing succeeds like success.

George L. Scofield, formerly one of the Gas Service Company new business managers, has been promoted to general new business manager of the Dominion group of properties with headquarters at Brooklyn, New York.

Mr. Scofield left the Gas Service Company in April, 1925 and has been new business manager of the Canadian Tilbury district of the Dominion Natural Gas Company.

H. W. Durgy, formerly new business manager of the Republic Light Heat and Power Company at Dunkirk, New York succeeded Mr. Scofield as new business manager of the Tilbury district. His headquarters will be at Brantford, Ontario.

Fred Wolfe, Stores Auditor, left March 21st for Vincennes, Indiana where he will spend a few days before leaving for California.

He will be connected with the Pacific Public Service Company at San Francisco with R. N. Dreiman.

N. R. Beagle, manager of the Jefferson City Division, Missouri Power & Light Company, together with Lieutenant Governor E. H. Winters and six other Jefferson City men, have been honored with appointments to the executive board of the Boy Scouts of America, Central Missouri area.

E. L. Adamson, of Oil Hill, Kansas, who has been an employee of the Empire Gas and Fuel Company, in the Chemical Department for the past seven years, has accepted a position with the New Business Department of the Western Distributing Company of El Dorado. He will work the territory which will be left by Mr. Walter L. Gillespey who will soon move to Madison, to look after New Business Work while the town is being piped for natural gas.

Edmund W. Wakelee, vice president of Public Service, was recently appointed a member of the Palisade Interstate Park Commission. The appointment was immediately confirmed by the New Jersey State Senate without referring the nomination to the judiciary committee.

Lloyd R. Leslie, who for some years past has been connected with the Philadelphia Suburban-Counties Gas & Electric Company as assistant commercial agent at Ardmore, Pa., and as commercial agent at West Chester, Pa., recently joined the forces of the Delaware Power and Light Company, Wilmington, Delaware. Mr. Leslie, in his new position has charge of appliance sales.

Erskine Ramsay, of the Alabama By-Products Company, of Birmingham, was elected chairman of the Southern Division of the American Congress at the closing session of its Industrial Development Conference at Atlanta during April.

Howard Willard Collard, Madison Wis., sales supervisor for the Madison Gas and Electric company, and Miss Frances Amber Fessenden of Beloit, were married March 30 in the home of the bride's parents, Mr. and Mrs. Jared S. Fessenden in Beloit. They are on a wedding trip to New Orleans, La., and will later be at home in Madison.

Joe T. Schilling, who has been in charge of commercial sales for the Des Moines Electric Company since October 1, 1927, has been given the added duties of commercial manager of the Des Moines Gas Company

He succeeds H. R. Stephenson as commercial manager of the gas company. Mr. Stephenson resigned recently.

Mr. Schilling is widely known in the public utility industry of the middle west, having been with the Des Moine Electric Light Company in various capacities for sixteen years. He attended Iowa State College, at Ames.

Dick Weston, of the Wichita New Business Department, is mentally calculating his commissions on an order which he has secured not long ago. The order was for $32,000 and covers the complete "gasification" of one of Wichita's newest apartment houses. The sale included gas fired boilers for heating and hot water service, 48 Electrolux refrigerators, 48 ranges, 48 Radiant heaters and 49 bushel incinerators.

However, he did not allow this fine sale to stop him but went right out the next day and sold another apartment house under process of construction, eighteen Electrolux refrigerators and ranges. The estimated annual consumption of these two apartment houses is eight million cubic feet.

John B. Klumpp has resigned as a vice-president of The United Gas Improvement Company after thirty-five years of continuous service. The resignation becomes effective May 1.

Mr. Klumpp will open an office as utility consultant in the Fidelity-Philadelphia Trust Building.

After graduating from Stevens Institute of Technology in 1894, Mr. Klumpp began work in the Engineering Department of the U. G. I. The offices at that time were in the Drexel Building. From 1904 to 1919 Mr. Klumpp made examinations and reported on all the utility properties, both gas and electric, which The United Gas Improvement Company investigated and purchased. He specialized in legal engineering, valuations and

rate matters. In 1924, Mr. Klumpp was made assistant general manager of the U. G. I. and has been a vice-president for the last five years.

Mr. Klumpp has served as president of the American Gas Association and is a member of the Board of Directors of that association.

R. W. Coblentz, for many years with with the New Business Department of the Portland Gas & Coke Company, Portland, Oregon, in charge of the Field Sales Division, has left Portland and located in

R. W. Coblentz

Tacoma, having accepted the position of Sales Manager with the Washington Gas & Electric Company, Tacoma, Washington.

Obituary

W. S. Barker Dies

William S. Barker, comptroller of Public Service Corporation of New Jersey, died April 2 of heart disease, at Clifton Springs, N. Y., whither he had gone following a break in health last summer. Mr. Barker had been with Public Service since July, 1903, and received his gold button signifying twenty-five years of service in July of last year.

Mr. Barker was fifty-four years old and was born in Philadelphia. He was graduated from Swarthmore College in 1895 and entered the employ of the United Gas Improvement Company.

He came to Public Service as assistant to the comptroller and when Percy S. Young was made vice-president in charge of finance and treasurer May 1, 1914, Mr. Barker was appointed assistant treasurer. He was made comptroller April 2, 1917.

He leaves a wife and four sons, William S. Jr., George G., Richard G. and Robert Scott Barker. Funeral services were held the morning of April 5, at the residence 207 Orange Road, Rev Archibald S. Black, pastor of the First Congregational Church, officiating. A large delegation of Public Service officials and friends attended.

Arthur M. Smith

Mr. Arthur M. Smith, Secretary and Treasurer of The Gas Machinery Company, 1900 Euclid Avenue, Cleveland, Ohio, died suddenly in New York City April 11, 1929.

Mr. Smith was born in Quincy, Illinois June 15, 1879.

He attended Andover Academy and Harvard University. He then went to Cleveland and joined The Gas Machinery Company, with which he has been connected since 1902.

His widow, Mrs. Lois Rucker Smith, and daughter, Suzanne, survive.

Edward A. Carton Dead

Edward A. Carton, formerly president of the Carton Furnace Company of Utica, N. Y. died in Denver Colorado, April 7, aged 67.

Harry A. Gager

Harry A. Gager, age forty-six; President of Salem, Ohio, City Council, civic leader in Salem and Columbiana County for many years, and prominent in the Natural Gas business in Ohio and Pennsylvania, died at the Charity Hospital, Cleveland, Ohio, on April first, following an operation.

He was born January seventh, 1883, in Salem, Ohio; educated in the public schools; served as reporter and city editor on the Salem News. In 1907 he joined the Natural Gas Company of West Virginia, and was actively identified with business of its Ohio operations until the Company became a part of the Ohio Fuel Corporation in 1925. Then he became Assistant General Superintendent. In 1926, when the Ohio Fuel Corporation merged with the Columbia Gas & Electric Corporation, he became connected with the management of the Pittsburgh group of the Columbia System as Special Agent.

He served as President of the Salem Chamber of Commerce in 1917-1918, took an active part in war work, was President of the Salem Kiwanis Club, a leader of the Democratic Party in Salem, and in Columbiana County, and widely known in Ohio Democratic circles. In 1924 he represented the 18th Ohio District as delegate to the famous Democratic National Convention in New York.

He was a member of Salem City Council in 1908 to 1910, served on local board of education from 1912 to 1914 and was serving a second year of his term as President of the Salem City Council at the time of his death.

His interests allied him with many other organizations. He was a member of the

Harry A. Gager

Salem Country Club, and of all the Masonic bodies in Salem, as well as the Shrine in Cleveland. He was a member of the Ohio Oil and Gas Men's Association, having been on its Advisory Committee. Was Secretary of the Pennsylvania Natural Gas Men's Association, and a member of the American Gas Association, serving on several of its committees, and Associate Editor of HAIL COLUMBIA—Columbia System Employees' Magazine.

He is survived by his wife—Mary Hardy Gager.

Trade News and Construction

United Engineers and Constructors, Inc. Activities

The Wisconsin Gas & Electric Co. has just awarded a contract for a second unit of U. G. I. Vertical Chamber Ovens, for its Racine plant.

The successful operation of the initial installation of 25 ovens has resulted in a decision to add to this capacity a second unit, consisting of 30 ovens which will give the Racine plant an installation having a rated daily capacity of 6,000 M. cu. ft. of 530 B.t.u. gas.

The installation will cover the ovens, with overhead coal bin and supporting structure, chimney and auxiliary oven apparatus.

A.U.G.I. Waste Heat Boiler will furnish steam generated from the sensible

heat in the waste gases from the setting.

There will be installed a 10'6" U.G.I. Producer with necessary flues and dust arrester. This producer will gasify small sizes of coke and breeze to furnish the producer gas for the new installation. A.U.G.I. High Duty Condenser will also be installed.

Consumers Gas Company, Reading, Pa., has placed orders for furnishing, delivering and installing 8", 4" and 2" welded steel mains extending from Reading to Topton, Pa. The approximate length to these mains will be 38,000 ft.

The United Light & Power Engineering & Construction Company has purchased an 8 ft. diam. U. G. I. 4 pass High Duty Condenser for installation at the Davenport, Iowa plant. This condenser will be different from the ordinary tubular condenser in that it is designed so as to render it very much more efficient and economical in operation than the standard tubular condensers generally used.

As the open season approaches the Distribution Engineering Dept. of The U. G. I. Contracting Company, is receiving various orders for the design and installation of distribution main work.

One of the recent orders received was from the Phila. Suburban-Counties Gas & Electric Co., for 8" and 12" welded steel main to be run from Chester, Pa. The total length of this main will approximate 21,000 ft.

The carburetted water gas apparatus of the Slatington, Pa., Gas Corporation is being remodeled by the installation of a new generator and other parts.

The Cedar Rapids, Iowa, Gas Company is having furnished a new cone top generator and other parts for its carburette water gas apparatus at the Cedar Rapid plant.

Virginia Public Service Co., Newport News, has placed orders for the remodeling of its water gas apparatus by the installation of new cone top generator and other parts to modernize the apparatus.

The Wisconsin Power & Light Co., has made a contract for furnishing, delivering and installing at the Beloit Gas Plant a 9 ft. U. G. I. cone top carburetted water gas apparatus arranged for operation of soft coal and also equipped with Chrisman Cycle, Model "B" Automatic Control and U. G. I. Generator Fuel Charger. Additional equipment includes oil pumps, hydraulic pumping system, take-off and blast piping.

The Malden & Melrose Gas Light Company, Massachusetts, is having remodeled its Carburetted Water Gas Apparatus by the installation of the new type washer-tar batter, which will replace the washer scrubber which has been in service for some time.

There is being installed for the Peoples Gas Company at its Vineland, N. J., plant a complete purifying system consisting of circular steel purifier with steam superheater, temperature regulator, Catalyst chamber and other auxiliary equipment required for the system.

Semet-Solvay Engineering Corp is making important additions to Canton, Ill. Gas Plant—Other Contracts Received

The Central Illinois Public Service Company has placed an order for important additions to its gas plant in Canton. A new 6' water gas machine, equipped with Backrun and hydraulically operated, is to be installed. Also a fuel handling system for this machine, and the required blast, steam, large and small piping and pumps. A water tube condenser and exhauster will be added to take care of the increased quantity of gas to be produced.

The Wisconsin Gas and Electric Company, Racine, has ordered a large ammonia scrubbing installation with water tube condenser, pumps, pipe and valves and operating platform.

The Central Illinois Public Service Company, Mattoon, has placed an order for a 6' water gas machine with Backrun. This is a repeat order, duplicating a machine built for this plant last year. Both machines will be equipped for complete hydraulic operation.

The Jersey Central Power and Light Company, Dover, has purchased from the Semet-Solvay Engineering Corporation of New York, a 6' water gas machine, built for Backrun operation. A new purifier of welded steel construction will also be built.

A quantity of scrubber grids and 10 stacks of cooling coils have been ordered by the Grand Rapids, Mich., Gas, Light Company. The coils will be 26 pipes in height and equipped with suitable distributing troughs. They will be sherardized to prevent corrosion.

There is being build an addition to the system of cooling coils on the plant of the Wilmington, Del., Gas Company. Twenty-two stacks of coils, each 14 pipes high are being installed, together with necessary auxiliary equipment. The coils will be sherardized to resist corrosion.

New Catalog Issued by Geo. M. Clark

George M. Clark & Co., Chicago, Ill., Division of American Stove Co., have issued a new 1929 Catalog, No. 131. The first chapter is devoted to the Lorain Oven Heat Regulator, and telling in detail its construction and how it operates. It shows their complete line of colored enamel and white enamel ranges, domestic science stoves, school and restaurant ovens, laundry stoves, hot plates, short order stoves and coil water heaters. Its size is 5" x 9" with a three color cover. Copy will be mailed on request.

Pittsburgh Valve, Foundry & Construction Company Elects New Officers

Effective March 1st, new officers took over the management and operation of the Pittsburgh Valve, Foundry & Construction Company.

The additions to the board are C. A. Anderson, Jr., long connected with the company as Vice President and Sales Manager, and who now becomes President and Director of Sales, and A. V. Wadsworth formerly Secretary-Treasurer and Manager of the Westcott Valve Company of East St. Louis, who becomes Vice President and General Manager.

The new officers are arranging for a much more aggressive policy in the Mid Continent and coastal fields.

Mr. Blake V. Fisher, for several years with Goulds Pumps, Inc., and for the last three years representing Westcott in Texas, will be District Manager with offices in Dallas, Texas, and will have representatives in Tulsa, Shreveport, Houston, and New Orleans.

The eastern division will be in charge of W. H. "Bill" Arnold long connected with Pittsburgh Valve, Foundry & Construction Company, and well known to the gas and oil interests both in the east and mid continent fields.

This arrangement provides for direct representation at Boston, New York, Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, St. Louis, Tulsa, Dallas, Houston, Shreveport and New Orleans.

Koppers Company Moves Offices

The Koppers Company had moved its offices from the Union Trust Building, Pittsburgh, Pa., to the Koppers Building at the corner of Grant Street and 7th Avenue, Pittsburgh, Pa.

Interesting Folder

"I Witness, or the Tragic Tale of Two Innocent Bystanders," is the title of a folder just issued by the Semet-Solvay Company, to emphasize the importance of selecting the correct point for protecting structural steel. The folder contains the autobiographies of two columns which were not shielded from the corrosive effects of chemicals and moisture. Information of value to the architect, contractor and plant and building owner is presented. Copies will be sent to anyone

interested on request to the Semet-Solvay Company, 61 Broadway, New York.

Sievers Appointed Dist. Sales Manager

Mr. Raymond M. Sievers was appointed District Sales Manager of Harbison-Walker Refractories Company, January 2, 1929.

From 1904 to 1928, Mr. Sievers was connected with the Evens & Howard Firebrick Company, St. Louis, Mo.; in 1917 he was appointed Sales Manager of that Company in charge of all firebrick sales, and in 1925 was elected Vice President and Director, with the title of Vice President and General Manager.

As District Sales Manager of Harbison-Walker Refractories Company Mr. Sievers makes his headquarters in St. Louis. His territory extends from the Mississippi River to the Rocky Mountain States.

Harris Joins Staff of Koppers

Alan H. Harris, Jr., for the last nine years, Coke Oven Superintendent, Lackawanna Plant of the Bethlehem Steel Company has resigned to join the Sales Staff of the Koppers Construction Company, Pittsburgh, Pa. Previous to joining the Lackawanna Steel Company, absorbed by Bethlehem in 1922, Mr. Harris had for five years been Superintendent of the Coal Products Manufacturing Company, Joliet, Illinois. He graduated from Stevens Tech in 1911 and entered the gas business in 1913 as Cadet Engineer with the Providence Gas Company.

General Refractories Company Appoints Agents in Cuba and Central America

General Refractories Co., will now have sales representation in Cuba and Central America. They have recently appointed Woodward & MacMillan, Edificio Metropolitana, Havana, Cuba, as sales agent for Cuba, Gautemala, British Honduras, Honduras, Salvador, Nicaragua, Costa Rica, Panama, Trinidad Islands and Jamaica.

New Plant Extension for The Brown Instrument Company

It is less than a year since The Brown Instrument Company completed the construction of a two-story addition to its Philadelphia plant, yet the continued rapid growth of the company's business has necessitated another addition to the present buildings.

An existing one-story wing of this plant will therefore be demolished at once, and a new two-story and basement building will be erected on the site.

Also a new central wing of two stories and basement will be constructed.

The additions will be constructed of reinforced concrete throughout. The cost of the new buildings will be approximately $200,000. Construction has already been started. The Ballinger Company, Philadelphia, Pa., are the architects and engineers.

New England's Biggest Refrigerator Shipment

Ice cubes for thousands of cooling drinks, a means of making mountains of frozen desserts and salads and protection for tons of food from the deteriorating effects of heat, is contained in the twenty-five car train load of gas and electric refrigerators which the Atlantic Utilities Company, Bridgeport, Conn., has just had shipped for distribution among its dealers throughout Connecticut, Rhode Island and Western Massachusetts. It is the largest single order of automatic refrigerators ever brought to New England and represents an investment of approximately $200,000. Eight hundred Electrolux gas refrigerators and two hundred Servel electric refrigerators comprise the shipment.

Gas Refrigerator Questionnaire

W. H. Gill, manager new business department Washington Gas Light Company, distributors for Electrolux, the gas refrigerator, recently sent 500 questionnaires to as many users. He received 150 replies and of that number only five contained complaints. The remainder made up a batch of testimonials that are now part of the sales plan used by company salesmen.

"More than twenty-five per cent return on our letter was considerably more than we expected," said Mr. Gill. "The five kicks we received, in our opinion, represent all there are. It's obvious that people will write to complain when they won't to praise. We sent out service men to the homes where the complaints came from and very quickly adjusted the small troubles that existed. The other letters are being made into a book and will be used by our sales force. They're the kind of testimonials that ring true. We expect that they will do much to promote business."

W. C. Katker Again Heads Favorite Stove and Range Company

At a recent meeting, the Board of Directors of the Favorite Stove and Range Company, of Piqua, Ohio, unanimously, re-elected W. C. Katker president.

Under Mr. Katker's direction, sales have increased 50% due to the changes on products, production, and personnel.

Peck Resigns from Detroit Michigan Stove Company

John V. Peck, Manager of the Garland Hotel Appliance Division of the Detroit-Michigan Stove Company, has resigned his position, and will take up his permanent residence at Los Angeles, California about June 1st.

Mr. Peck joined the Michigan Stove Company in 1897 as traveling representative in New York and Pennsylvania, later adding New England to his territory, which he traveled until 1916.

During the World War he was stationed at Washington, D. C., looking after the Garland interests, and since that time he has given his entire attention to the Garland line of Hotel Appliances.

When the Michigan Stove Company and the Detroit Stove Works consolidated under the name of the Detroit-Michigan Stove Company, Mr. Peck was made manager of the Garland Hotel Appliance Division, which he has held to this time and which he is leaving to enjoy the fruits of his efforts for the past thirty-two years.

His successor will be Mr. Richard R. Hindley, who has also been with the Garland Division for several years as Assitant Sales Manager.

Stillwell Joins Norfolk Sales Office

Mr. R. F. Stillwell has joined the Norfolk Sales Office of the Consolidation Coal Company as Service Engineer for the sales territory served by that office. Mr. Stillwell is an experienced Combustion Engineer and a graduate of the Engineering School of the Ohio State University. Prior to joining the Consolidation Coal Company, he was Combustion Engineer with the Smoot Engineering Company.

McWane Pipe for Salt Lake City

A feature of the recent contract placed by the Utah Gas & Coke Company for approximately 130,000 feet of cast iron gas pipe for use in an expansion program embracing Salt Lake City, Ogden and adjacent points, is that this large quantity of cast iron pipe is to be manufactured as well as used West of the Rocky Mountains. It will be made at the Prove, Utah, plant of the Pacific States Cast Iron Pipe Company, an affiliated company of the McWane Cast Iron Pipe Company, of Birmingham, Alabama, making pipe under the McWane processes.

The new mains will be used for the distribution of natural gas.

Solving Distribution Problems

Corrosion prevention, joint problems, metering, pipe coating, unaccounted-for gas, and other important subjects engage attention of Distribution Conference.

Editorial Staff Report

NEARLY 500 engineers and executives interested in problems of transmission and distribution of gas held a very successful conference in Boston, Massachusetts, on April 3, 4, and 5. This was the annual Distribution Conference, held under the auspices of the Distribution Committee of the American Gas Association, which this year had the active participation of the Operating Division of the New England Gas Association. The meetings were arranged by a committee under the able chairmanship of F. M. Goodwin, of the Boston Consolidated Gas Company. Mr. H. W. Hartman, Secretary of the Technical Section of A. G. A., had charge of administrative details and served as secretary of the conference.

The problems of pipe joints and the means for pipe coating and corrosion prevention formed the two principal technical subjects for consideration of the conference, a full session being devoted to each of these two important topics. However, other distribution problems were not neglected, for worth while contributions were made on the subjects of high-pressure distribution, portable equipment, metering, unaccounted-for gas, and conversion of low-pressure to intermediate-pressure systems. The sub-committee reports on these topics were ably supplemented by papers and in some cases generous discussion from the floor. The availability of most of the reports and papers in mimeographed form for the use of all in attendance greatly contributed to the pleasure of those participating in the conference and eliminated the necessity for much tedious reading of extended reports from the platform.

Projected Research

Two of the sub-committees reporting at the conference announced important new research projects planned by the Association. J. K. Crowell, of Mt. Vernon, New York, announced that Dr. Scott Ewing had already undertaken work as a research associate at the Bureau of Standards for the A. G. A. He will be engaged on an investigation of protective coatings and corrosion prevention, working under the direction of Mr. Logan, whose report to the conference is summarized below.

The Pipe Joint Committee, under O. S. Hagerman, announced its new research program, including investigations which are to be made in cooperation with various universities. One of the projects mentioned as illustrative of the studies contemplated relates to the metallurgical characteristic of lead joints.

Meters for large industrial-gas installations was one of the principal subjects discussed under the report of the sub-committee on meters, W. H. Bettle, Chairman. This topic aroused a discussion involving some difference of opinion as to how large-capacity meters can be tested at rates comparable with those at which they are used in actual service on customers' premises. Use of batteries of small-size meters in parallel as a standard for comparison in series with the large meter was one proposal that has been worked out successfully. Attempts to extrapolate low-rate calibration to high rates were shown by other participants in the discussion to lead to serious error in some instances described.

The meter committee report, which is available from A. G. A. headquarters to those desiring it, also considers questions of life of meters in service and the effectiveness of semi-chrome leather diaphragms; and gives in its appendix a full description of test of two impeller-type meters made by W. J. Lutz and J. B. Boniface. The experience of the same investigators with wet station meters is also included in a second appendix.

High-Pressure Transmission

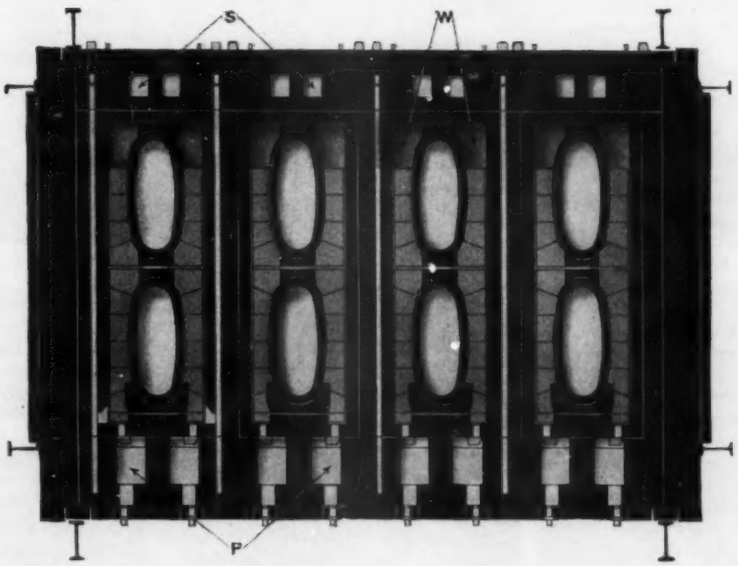
The trend toward higher pressures in distribution and the necessity for long-distance gas transmission aroused considerable interest in the report of the committee on high-pressure distribution, L. A. Kirch chairman. The report of this sub-committee as pre-printed for the conference consists primarily of five exhibits giving cost data on gas transmission and gas pumping units. These several exhibits are worthy of study by any management having such problems, not alone for the data which they afford, but also because of the careful methods described for studying the real costs involved in high-pressure gas handling. Exhibit A, for example, is particularly good in contrasting electric-motor, gas-engine, and steam-engine drives for delivery of 260 M of gas per hour at 100 lbs. pressure with 100 per cent capacity load factor. This exhibit discusses both investment and operating costs and shows how they are worked out for the particular set of conditions to which the investigation originally applied. Those having an analogous problem will find much of interest in the several examples presented by the five sets of cost calculations.

The committee after consideration of these several exhibits draws several conclusions—that pumping equipment for high-pressure (20 lbs. or more) is largely confined to straight-line reciprocating compressors; that either steam, gas, or electric drives are satisfactory; and that gas drive necessitates larger investment and maintenance cost than electric-motor drive. The committee, however, emphasizes the fact that "Each compressor installation is an individual problem and a final selection of the most economical type of drive is dependent largely on the cost or value of the different kinds of energy."

The capital invested in high-pressure transmission mains has been considered by this sub-committee and it summarizes the costs reported by six of the committee members from experience gained in 27 different transmission projects of recent construction. The range of costs experienced is shown by the table on page 76.

(*Continued on page 76*)

GLOVER-WEST
Vertical Retorts



The Retort Setting is characterized by several other points peculiar to the Glover-West System. The admission of the secondary air to the combustion chambers by way of passages in the walls not only makes use of radiated (otherwise lost) heat but ensures the stability of the walls under maximum temperature conditions.

P = Producer gas uptake.
S = Secondary air uptake adjacent to
W = Internal Waste gas uptake.

All retorts are equally heated on both sides. Expansion is fully allowed for. Temperatures are under complete control.

WEST GAS IMPROVEMENT CO.

Builders of Coal Gas Plants

441 Lexington Ave. New York

Solving Distribution Problems

(*Continued from page 74*)

Cost of Transmission Lines

1927 and 28 costs as reported by six companies includes all overhead charges.

Size of Pipe	Cost/ft.—Dollars									Avg.	Unit Costs*
3	.67									.67	.70
4	.60	.88[1]	.89	.94	1.00	1.27	1.36			.99	1.16
6	.96[1]	1.09	1.12	1.26	1.28[2]	1.30	1.66	1.84[2]	1.96[3]	1.39	1.57
8	1.41	1.49[2]	1.63	2.33						1.72	2.20
10	2.28	2.60	2.75	3.13	3.27[4]					2.81	2.77
12	2.87									2.87	3.44

[1] No protective coating.
[2] Laid during winter and early spring.
[3] Rock requiring blasting—coarse gravel—58,600 sq. ft. paving.
[4] 30 per cent urban, 70 per cent rural.
* As used in 1927 and 1928 studies by Sub-Committee on High Pressure Transmission.

Unaccounted-for Gas

An amazing difference in practice in calculating unaccounted-for gas is shown by reports made to the committee on this subject, M. I. Mix, chairman. The experience of various companies, whose data have been summarized by the statistical department of A. G. A. and accompany the committee report, shows equally surprising figures. The range in unaccounted-for, expressed as percentage of total production and purchase, is from 0.12 per cent to 14.95 per cent for these 22 companies. When calculated on the basis of thousands of cubic feet unaccounted-for per mile of equivalent three-inch main the range is from 2 M to 550 M per mile per year. This and other features covered by the committee report indicate clearly that many companies must be using methods which are far from really significant to this important point.

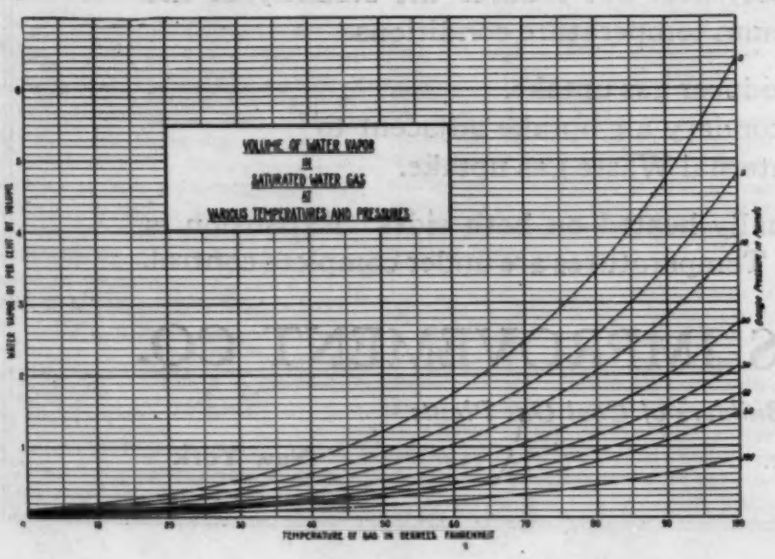
After an extended discussion of the more important factors contributing to unaccounted-for gas, the committee concludes its report with four recommendations for further consideration, as follows:

"1. That consideration be given to a practical method of testing station meters, which will increase and improve accuracies of the meter at the rate at which the meters normally are operated. For this purpose, means should be provided for testing the meters near their normal rates of operation.

"2. That a more general use of standards for temperature and pressure be applied for correcting gas volumes of gas produced and purchased, in order that the present inequalities applicable to these factors be eliminated, and permit 'unaccounted-for gas' figures of various companies to be more favorably compared.

"3. It is felt that neither the 'per cent of unaccounted-for gas' expressed as a portion of the send-out, nor the unaccounted-for gas per mile of equivalent three-inch main' are adequate methods for referring to 'unaccounted-for gas' between companies, and it is recommended that some other basis should be proposed, which will combine more factors than are included in these two present methods, consideration being given to the gas services as well as gas mains where leakage of gas is involved.

"4. That the future committees include in their report specific instances of gas leak, A. G. A. tests and methods used for mitigating "unaccounted-for gas' in different companies throughout the country."



Welded Joints

The report of the Pipe Joint Committee was supplemented by two papers on joint-welding practice. Mr. David L. Brown, of the Consumers Power Company, Pontiac, Michigan, reported very fully on his experience in the field application of electric welding of gas transmission and distribution systems. The work of this company has extended over a period of five years and includes all types of distribution work, from service lines up to 10-inch high-pressure transmission pipe lines. The paper describes material used, organization of field crew, methods of pipe alinement, welding, testing, and other features of distribution operation.

"Field Application of Oxy-acetylene Welding" was the title of the companion paper, by E. V. Kesinger, City Service Gas Company, Bartlesville, Oklahoma, who presented a most elaborate report illustrated by a large number of splendid lantern slides. The paper included a discussion of an effective welding organization, costs of welding, effective procedure control to insure good work, the making and installation of specials, and the problem of leakage. Since the complete report is available to members of the Association in mimeographed form it is necessary to give here only the two important conclusions presented by Mr. Kesinger.

"1. An oxy-acetylene welded joint is a practical type of joint for long distance, high pressure, gas transmission lines. The main advantages of the welded joint are: lowest leakage rate; least maintenance; ease of protecting joint from corrosion; joint not affected by commodity being transported; joint remains tight and confidence in welded line increases with age. Some of the disadvantages are: the relative high cost of the joint itself; the extra supervision the welding must receive; the effect of all-welded construction on the design of the pipe line; all of which reflect as an increased cost for the completed line.

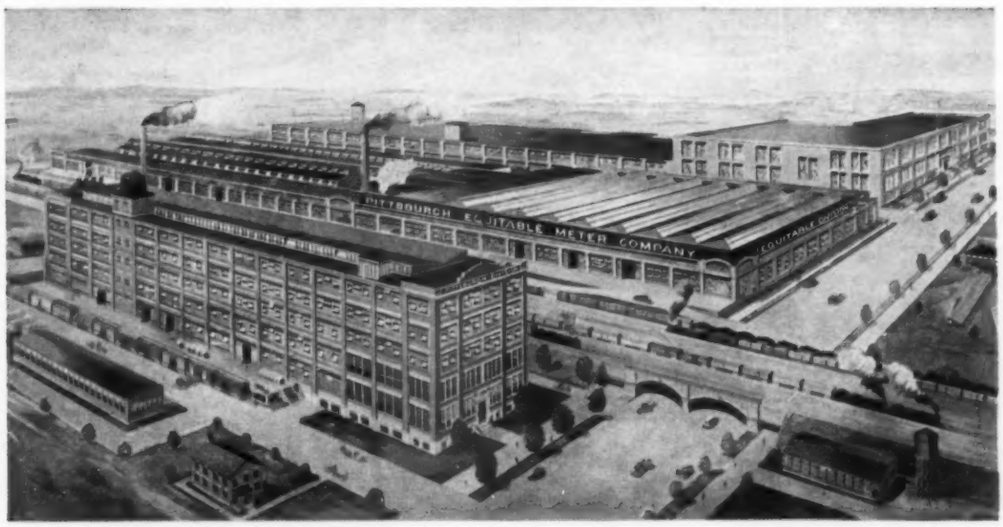
"2. Joints welded under field conditions vary in strength, even when welded by competent welders under close supervision. Many factors contribute to this condition, such as varying amount of penetration which is possibly the largest individual factor. However, the indications are that 75 per cent of the field welded joints will develop 90 per cent of the pipe strength, with the remaining 25 per cent developing very close to 100 per cent of the pipe metal strength."

Pipe Corrosion

Experiences in coating of pipes for the prevention of underground pipe corrosion were reported on by three papers submitted under the auspices of the Committee on Pipe Coatings and Corrosion. Practical field experience in the western

(*Continued on page 80*)

EMCO — Wherever You Go



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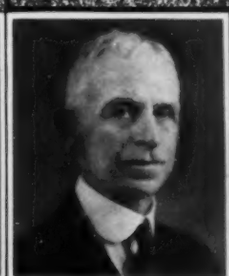

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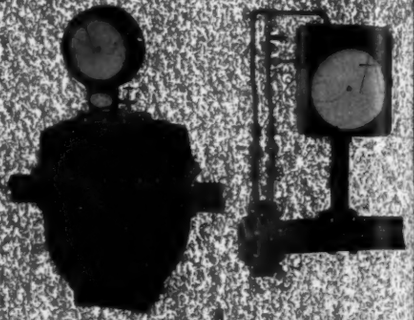

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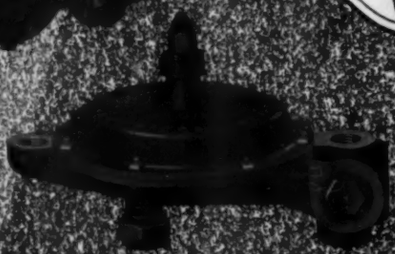

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New York Power & Light Corp., Schenectady, N. Y.

Since 1876 CE-CO Gas Holder Paints have seen service under every imaginable condition of climate and exposure to chemical action. The holders illustrated are protected with these paints; and other CE-CO paints also are successfully withstanding the severe conditions to which tanks, structural steel and other interior and exterior surfaces of various types are subject in the gas industry.

CE-CO PAINT PROTECTION THROUGHOUT THE PLANT

Deterioration of your buildings and equipment will be slowed down tremendously if you apply the best possible paint protection.

There are CE-CO paints that are specially formulated for use under conditions peculiar to the gas industry.

There are special protective paints for gas holders, purifiers and generators.

There are special paints for stacks, boilers and machinery.

There are special protective coatings for pipe lines and gas mains, and there are fume-resisting and acid-resisting paints for the interiors and exteriors of buildings.

In a CE-CO painted gas plant—and there are many of them—corrosion, rust and deterioration find few vulnerable spots to attack.

One of the most widely used metal preservative paints is CE-CO No. 250 Sublimed Blue Lead which neutralizes pitted corrosion and prevents the spread of rust underneath the paint film. Furthermore, it is not readily affected by sulphur, carbonic and other gases that may be present in the atmosphere, and is one of the best rust inhibitors on the market.

CE-CO No. 116 Carbon Black Paint is likewise in extensive use and is recommended as a finishing coat on general steel and iron work, including structural steel, coal conveyors, relief holders, purifiers, generators, etc.

The economy of a special paint for a special purpose has been demonstrated over and over again wherever CE-CO Technical Paints have been applied. It will be a sound investment to use CE-CO paints on your paint jobs.

Send for descriptive literature and color card 3-A.

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Solving Distribution Problems

(*Continued from page 76*)

states was given in a paper by Dozier Finley, who is chairman of the corrosion committee of the Pacific Coast Gas Association. A second paper was by C. H. Waring, of Kansas City.

The elaborate investigations of soil corrosion and protective coatings being conducted by the U. S. Bureau of Standards were reported upon by K. H. Logan. This report included the first published resume of the observations made on specimens of pipe removed during 1928 after six years of underground exposure as a part of the elaborate field program which is being carried out by the Bureau. As a result of observations on this additional group of 900 specimens Mr. Logan draws some important conclusions.

"Although comparisons of material are not reliable at this time, Table 2 shows two things rather definitely. It will be noticed that usually in a given soil the differences in the rates of corrosion of different materials are small and that there are large differences in the rates of corrosion of the same material in different soils. This confirms the conclusion reached after examining specimens removed in 1924 and 1926 that soil characteristics are chiefly responsible for soil corrosion.

"Since in several soils severe corrosion of all materials is observed, we would infer that increased life of pipe lines is to be looked for either in a radically different pipe material or by protecting those now available against soil action. Temporarily at least, the second alternative seems to be the most promising solution of the soil corrosion problem.

"Under many soil conditions, pipe lines require expensive repairs because of leaks before they have lost any considerable amount of pipe material. The pitting of the material rather than the loss of weight determines the time when repairs are required although in these days of welding the penetration of the pipe wall by a single pit does not mean the end of the useful life of the pipe.

"Comparison of the corrosiveness of the soils under investigation as shown by Tables 2 and 3 reveals the fact that some soils cause much more uniform corrosion than others and that the corrosiveness of a soil from the standpoint of rate of loss of weight of the pipe may be quite different from that based on the rate of penetration of the pipe wall.

"Having obtained data on similar specimens removed at the close of two, four and six years; it is interesting to compare the results of the examinations of these specimens. Looking first at the figures for rates of loss of weight we find that in 20 soils there is a continuous decrease while three other locations show a minimum rate for the third period. Only two soils show a continuous increase in rate and four show a maximum rate for the third period. We are led to conclude, therefore, that in many if not in most soils there is a tendency for the rate of loss of iron to decrease. This decrease may be caused by changed soil conditions after the earth in the trench has thoroughly settled or by the protective effect of the corrosion product. We find 31 soils which show lower rates of loss for the third period than for the second. If we assume that a year is sufficient to allow the trench to settle, we can conclude, tentatively at least, that the corrosion products tend to retard corrosion although it is not clear whether the products form a protective coating or render the soil adjacent to the pipe less active.

"While there are a few soil conditions such as poor drainage, the presence of large amounts of soluble salts, cinders, acid mine water, etc., which are generally recognized as corrosive, serious corrosion also occurs occasionally under conditions in which the cause of the soil action has not been identified and in general it may be said that the problem of determining the corrosiveness of soils has been only partially solved. Laboratory soil corrosion tests are in themselves usually unsatisfactory as indicators of corrosion in the field because the latter depends not only on the chemical nature of the soil but also on temperature, drainage, soil structure and the amount and distribution of the supply of oxygen and moisture.

"Reports of investigators of corrosion in the arid regions of the West indicate that usually the corrosiveness of western soils is roughly proportional to their electrical conductivity and this in turn is determined largely by the amounts of salts which they contain. There is some evidence that the action of carbonates in soils must be considered apart from that of the other salts.

"In eastern soils the total soil acids seems to be an important if not the controlling factor in their corrosiveness.

"At present there are many questions regarding coatings which cannot be answered. The following outline of some of these problems may help those interested in coatings to realize the need for the assistance of competent technical men who can devote their entire time to the problem of pipe line protection. The user of coatings should not depend on the manufacturer for data on their value and the manufacturer should not expect the consumer to do his research and development work. In cases where their interests are identical as in developing the fundamental principles involved and establishing standard methods of testing they can well afford to cooperate.

"Since all evidence tends to show that no bituminous coating absorbs no water and that at least some types of coatings should have high electrical resistance which is incompatible with the absorption of much moisture, we would like to know the extent to which a coating may absorb moisture and remain satisfactory. Does the absorption of water indicate a breaking down of the coating? Does the expansion and contraction of the pipe with the changes in temperature and the shrinking and swelling of the soil with changes in moisture content tend to break down a protective coating? Does the pipe move within the coating, thus loosening the bond between the two or does the coating move with respect to the earth thus tending to work the particles of stone and hard earth into the coating? Do small bare spots on a coated pipe tend to localize corrosion and make the pipe fail sooner than a similar pipe with no coating? Under what soil conditions do the various types of bituminous coatings deteriorate mechanically or chemically? What laboratory tests will indicate that a coating will give satisfactory field service? What are the advantages and disadvantages of woven and felted fabric and of inert fillers when used to strengthen or thicken bituminous coatings? How can the adhesion, resistance to shock and yield to pressure be measured and to what extent should these properties be called for in a coating specification? What is the value of the so-called inhibitors in coatings? Do they prevent corrosion after moisture has reached the pipe and how long will they continue to afford protection? Should tightly adherent mill scale be removed before a pipe is coated? What are the relative advantages of covering the pipe in the field and at the pipe yard? Does protecting sections of a line in non-corrosive soil reduce galvanic action and thus reduce the corrosion in bad soil along the same line? What must be the relations between the cost of a coating and its useful life, the corrosiveness of a soil and the cost of a pipe line to justify the application of a given protective coating?

Gas Measurement Short Course Sets New Marks

THE largest and most comprehensive gas measurement short course in the history of such projects closed at Norman, Okla., April 18 after a three-days session. Attendance exceeded 450. Fourteen states were represented in the registration, these being in numerical order of representation Oklahoma, Texas, Louisiana, Kansas, Pennsylvania, Missouri, Arkansas, Ohio, Colorado, Massachusetts, Illinois, Mississippi, Connecticut and New Mexico. Members of the engineering faculty of the University of

(*Continued on page 82*)

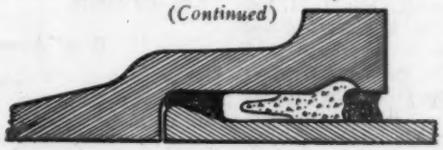
TYPICAL PAGE FROM SPECIFICATION CATALOG

(Send For Your Copy)

SPECIFICATIONS USING CEMENT

CONSTRUCTION OF JOINT:

(Continued)



(Fig. 4)

The Southwestern Style 1100 Self Healing Pipe Joint Ring is then followed by the remainder of the joint being calked with cement (see Figure 3). A separate mixture of fresh cement will be required for each joint. Portland cement complying to the A.S.T.M. standard shall be used in "neat" form, mixed with just sufficient water so that no moisture can be squeezed out when grasped firmly in the hand. This cement must be firmly calked into the joint to within one-half inch of the face of the bell by means of Southwestern Style "A" Special Cement Calking Tool. If cement shows moisture during the calking, it should be removed at once and replaced with a mixture sufficiently dry to permit calking.

(Fig. 5)

Insert and calk back firmly against the cement one complete strand of Style 900 Pure Braided Jute (see Figure 4) cut so that ends overlap approximately one-half inch, and then finish off with cement as shown in Figure 5.

SOUTHWESTERN STYLE "A" SPECIAL CEMENT CALKING TOOL

It is very important to use a broad nosed specially shaped calking tool for driving cement into the bell and spigot joint. The special Style "A" Calking Tool made of forged steel pictured here has been designed to efficiently serve this purpose.

Southwestern Pipe Joint & Engineering Company

1108-1110 Fifth Avenue
BIRMINGHAM, ALABAMA
(Factory shipments from Passaic, N. J.)

Gas Measurement Short Course

(*Continued from page 80*)

Oklahoma and engineers, graduates of other technical colleges of established standing, conducted class work; while manufacturers' representatives, including several shop foremen, supervised bench work, more than $25,000 worth of mechanical equipment having been installed in the engineering building of the university by manufacturing companies for use in this course. This is the most comprehensive course offered anywhere, covering not only domestic gas measurement but the measurement of natural gas in production, transportation and distribution involving maximum quantities and all pressures. Professor W. H. Carson of the Oklahoma university engineering faculty, directed the school. F. D. Frank of the Cities Service Gas Company, Bartlesville, was chairman of the general committee.

The three-day program opened with an address by President W. B. Bizzell of the University, who, in welcoming the group for its sixth annual session, expressed his pleasure over the fact that interest in the project had again established a new high mark in attendance. An outstanding feature of the course was the paper and discussion on "Early Developments of Orifice Meter Measurement" by Thomas R. Weymouth of Tulsa, president of the Oklahoma Natural Gas Corporation and of the Oklahoma Utilities Association.

The annual banquet April 17 proved one of the most unique and interesting occasions of its kind in the experience of those present. It was featured by a mechanical toastmaster and a complete absence of speeches. The toastmaster was a store-window figure, made up and manipulated by seniors of the engineering college. It stood up, sat down, flashed its eyes, turned its head and wagged its jaws, speaking, singing and smoking a real cigar. It announced the several entertainment numbers which were exceptional in their character and excellence. President W. B. Bizzell, Dean J. H. Felgar of the College of Engineering, and others present came in for rough grid-iron handling by the mechanical master of the situation to the great delight of the crowd.

School authorities, manufacturers' representatives and utility executives who saw the course in operation were enthusiastic in their approval of the project and their praise of the intensive work done by the men privileged to attend.

The course is sponsored annually by the University, the Corporation Commission and the Oklahoma Utilities Association. E. C. Joullian of Oklahoma City, chairman of the Gas Division of the Oklahoma Utilities Association, recently announced the appointment of D. A. Sillers of the Lone Star Gas Company and the Community Natural Gas Company of Dallas, Texas, as chairman of the general committee for the seventh annual course, which will be held at Norman in the spring of 1930 on dates to be announced later.

Twenty-Fourth Annual Meeting of the Mid-West Gas Association

TIME—Three minutes of two, April 15, 1929.

Place—New Nicollet Hotel, Minneapolis, Minnesota.

Doings—Twenty-Fourth Annual Meeting of Mid-West Gas Association.

Thus commenced the three day session which proved to be one of the most constructive programs ever offered in the Middle West. Perhaps it was coincident that the subjects selected by the respective speakers fitted so well one with another. At any rate, the fulfillment of the program must have been to the audience like the reading of successive chapters in an interesting book.

An unusual feature was the staging of an historical pageant of the gas industry, under the auspices of the Minneapolis Gas Light Company. The parade, which was over a mile in length, was led by a brass band while another band brought up the rear.

One other happening of importance was the appointment of a Regional Advertising and Publicity Committee, consisting of:

J. K. Swanson, V. P. & Gen. Mgr., Minneapolis Gas Light Co., Minneapolis. W. E. Derwent, V. P., Geo. D. Roper Corp., Rockford, Illinois. C. N. Chubb, Pres., Iowa-Nebraska Light & Power Co., Lincoln, Nebr. F. A. Lemke, Secy-Treas., The Humphrey Co., Kalamazoo, Michigan. C. A. Leland, Jr., V. P. & Gen. Mgr., Des Moines Gas Co., Des Moines, Ia. W. H. Hodge, V. P. & Mgr., Sales & Adv. Dept., Byllesby E. & M. Co., Chicago. Mark Pendleton, Iowa Public Service Co., Fort Dodge, Iowa. C. A. Nash, Sales Mgr., United Light and Power Co., Davenport, Iowa. H. C. Orton, Interstate Power Company, Dubuque, Iowa. Sutherland Dows, Iowa Ry. and Light Corp., Cedar Rapids, Iowa. E. F. Buhman, Iowa, Southern Utilities Co., Centerville, Iowa. Joe Carmichael, Director, Iowa Committee on Public Utility Information, Des Moines, Iowa. James H. Turner, V. P., Wm. H. Rankin Adv. Co., Chicago, Ill. (Advisory Member).

The work of the committee will be such as to direct and make effective, a campaign of publicity to make the public in the Middle West "Gas Conscious." It will fit in the program being undertaken by the American Gas Association, soon to be made public, as well as with the activities of the Pacific Coast and the New England States.

Good Attendance

An audience estimated at about 250 heard Mr. George E. Whitwell, Manager of Sales and Service, The Philadelphia Company, Pittsburgh, Pennsylvania, speak on Monday afternoon, his subject being, "The Increase of Domestic Gas Consumption." Mr. Whitwell aroused an enthusiasm and interest that remained unabated throughout the entire meeting. He directed attention to the fact that a study of the electric energy used in percolators, toasters, waffle irons, etc., would account for many thousands of cubic feet decrease in domestic gas consumption on the part of the consumers who utilize these appliances. He directed attention also to the importance of Home Service in the matter of retaining and expanding the Gas Company's field of service, and further emphasized the necessity for stimulating "Gas Mindedness" on the part of the public at large.

The general theme of the program was further developed in the President's address, entitled, "In Passing. A Valedictory to the Archaic." Among the several points adduced by Mr. Stein in his talk was the opinion that, while a less amount of food is being cooked and prepared at home than formerly, food is still being cooked and for more people, from which the inference was drawn that the change is more geographical than psychological. In other words, there still exists a domestic demand for gas, although it may have taken on the characteristics of an industrial patronage. A further point was the possibility of gas companies becoming successful merchandisers by the application of successful merchandising methods both as to buying gas burning appliances for resale and the employment of trained and skilled retail appliance salesmen. He also emphasized the necessity for executive consideration of the proposition that gas companies on the whole are both wholesalers and retailers of their commodity. No less interesting was the definition of Home Service, which is quoted verbatim.

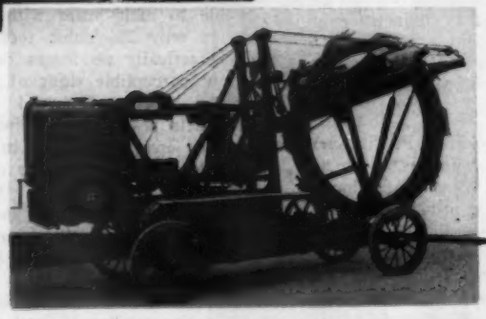
"Closely related to the foregoing is the matter of Home Service. The subject seems to survive its flagrant abuse; the abuse of omission rather than of commission. It merits the correct definition and the best that I can do in my humble fashion is to say what, in my opinion, it is not, rather than what it is. As much

(*Continued on page 84*)

DOES MORE WORK IN MORE PLACES SAVES MORE MONEY!

Power

Compactness



Mobility

That trencher is the most valuable that is the most usable, that is the most economical to operate, that eliminates the most hand labor.

For downright general utility and extreme usability you will find the Cleveland Baby Digger the most efficient and practical piece of equipment you can own. Statistics compiled from the experience of a hundred gas companies, using Baby Diggers, show that these trenchers were usable on more than 90% of their trenching jobs, and that the average cost was less than 25% of former costs by hand labor.

Highly Powered—it delivers maximum trench footage in the toughest and hardest soils. Extremely Mobile—it moves from location to location at truck speed—loaded on its own specially built trailer.

Precision Built of the finest steels obtainable and according to advanced engineering principles—Modern, up-to-date in every way, particularly adapted for gas trencher digging,—whether the work is to be done in open space or in confined areas the Baby Digger speeds up construction and cuts trenching costs.

Investigate today. Write for full information.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the small Trencher"

20100 St. Clair Ave.
Cleveland, Ohio, U. S. A.

THE BABY DIGGER

Mid-West Gas Association

(*Continued from page 82*)

as I dislike negative explanations, it is better emphasized in this manner than otherwise. The indifferent or careless delegation of that activity known in a true sense as 'Home Service,' to the hands of recipe mongers, instead of those properly trained in Home Economics and Home Management, is not Home Service. There are probably many more negations which this reference will suggest to you."

Mr. Arnold Peterson of the Time-O-Stat Controls, Elkhart, Indiana, delved into the subject of automatic controls, pointing out the salient features of the various types of equipment and the reasons for their respective uses.

As was to be expected, the paper entitled "A Merchandising Program for the Gas Industry" by Professor Herbert B. Dorau of Northwestern University, Chicago, was well received. His discussion was so vital and far reaching in its significance that some of the outstanding features of it should be alluded to. Professor Dorau made it quite clear that in the face of present business competition, gas, usually considered a commodity of single use, is no longer a monopoly. He stressed the fact that a gas connection serving well designed and good appearing appliances, can be utilized effectively for maintaining a demand for gas against the ever present competition. He further pointed out that efforts were now needed to make the average customer a better customer and to secure new and different classes of customers; indicating that the additional business to be obtained from the latter is the more profitable of the gas companies' business and that it would pay to spend more to get it, as well as to obtain the additional business available from present customers. He emphasized the need for the gas industry to realize that as competition becomes keener, gas utilities will have to resort to methods of marketing advertising and selling which others have found successful.

Mr. J. B. Wootan, Editor, Public Service Magazine, Chicago, Illinois, in an address entitled, "The Weight of Character," urged that public utilities raise and maintain standards of policy and conduct which will be an invulnerable defense against unfair criticism. "Very naturally the public utility is subject to public criticism," Mr. Wootan said. "It ought to be. Criticism is wholesome if fair and honest, and there is always a defense against dishonest criticism or unfair attack in a clean motive and sound policy with good service. The utility will deserve and earn public confidence when it brings the weight of a good character to shape every policy and program. When it does that the public utility is culpable if it does not exhaust every proper means of defending itself against unjust assault.

E. H. Vieregg
President-Elect

"Mr. Hoover, you know, has said that the public utility must do business with glass pockets. One might wish that some of the brethren who make a business of attacking the utilities did business the same way. But it's good advice. The utility must keep itself above reproach."

Of more than usual interest was the address entitled, "Running and Reading" by Major Alexander Forward, Managing Director of the American Gas Association, New York City. Major Forward drew attention to the importance of research and paid tribute to the work of the A. G. A. Laboratory. A most important announcement to the industry was made in his statement concerning a recent discovery and application of new methods in brass melting, employing gas as the fuel. He informed his audience that with a new type of crucible which has been in operation a sufficient number of hours to prove it successful, it is now possible to melt brass with a consumption of only 2½ cubic feet per pound, with practically no losses of metal and without perceptible signs of wear in the crucible. Major Forward stated that these facts practically eliminate all other forms of competitive fuel in brass melting. Other announcements of equal importance to the industry, he advised, would be forthcoming at an early date. Mention was also made of new and valuable information in bread baking with gaseous fuel and attention was called to the fact that the largest bread baking oven in the country is fired with gas.

One of the most inspirational talks given was that made by Mr. James H. Turner, Vice President of the Wm. H. Rankin Company of Chicago, on the subject of "Advertising." Mr. Turner quite properly called attention to the conspicuous absence of publicity on the part of gas companies needed to arouse the public's interest in the utilization of gas. He very clearly showed the value of radio broadcasting as supplementing the printed word. It was Mr. Turner's paper that resulted in the Convention's action looking toward the appointment of the Regional Publicity and Advertising Committee.

Dr. C. H. Goudiss, of New York, Editor of the Forecast Magazine, talked on the "Power of Food." He emphasized the importance of food and its proper preparation to the well-being of the human race.

"Air, light and food are our three weapons against disease and death," Dr. Goudiss said. "Nature supplies only one kind of air and of light, but many different kinds of food. The whole course of human life depends primarily on what, how and when we eat. To neglect food is to neglect the very source of the one material that builds and repairs our bodies. What we eat is all we have to build with."

"Air, light and food are our three phets" by Mr. A. Gordon King, Service Engineer of the American Gas Association, New York City, was indicative of a large amount of time and effort spent in its preparation. Mr. King developed his subject in a masterful fashion, treating the matter in literal accord with the title. He gave consideration to the development of the industry from the time of Murdock and showed in a most convincing manner how the industry has developed beyond the fondest expectations of those who attempted to foretell its trend when they wrote and talked about it in past generations. The prophets of the past, while they correctly envisioned the happenings of today, were conservative in their estimates of what was to happen at this time. Among the important points raised in his discussion was the fact that gas would be abandoned as an an illuminant and that its use would be ultimately a heating fuel applicable in industries and in homes. Of equal importance was the reference made by early students of the industry to the necessity for proper advertising and sales activities.

"Forced Air Heating" was the title of a paper by Mr. J. C. Miles, of the Warm Air Furnace Company, Cleveland, Ohio, in which Mr. Miles took issue with the design of many existing heating systems. He quite aptly stated that, in so far as heating systems were concerned, in the homes, the public and the gas companies should be more "Air Minded." He called attention to the wide differential between ceiling and floor temperatures existing largely in homes heated with hot water and steam, and with warm air systems of the exclusive gravity type. He pointed out the necessity for radically departing from the accepted temperature at the breathing line and emphasized the necessity these days for comfortable temperatures nearer the floor, namely, where "Shoe leather meets silk." Mr. Miles provoked a good deal of interesting discussion, particularly when he spoke of the necessity of more heat of convection

(*Continued on page 86*)

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs

SUPERIOR METER CO.
167 - 41st Street
Brooklyn, N. Y.

"THE PERFECT FREIGHT ELEVATOR"

"Uncle Billy, that is sure **SOME** claim. As if there can be anything perfect made by man. You make me laugh!"

"Well, laugh your old head off if you like. If a thing is **SO** it makes no difference what you don't believe or how loud and long you laugh."

Let's get down to Brass Tacks old Laffer!"

"Name a single desirable thing in an elevator the Ridgway does not have—we dare you!"

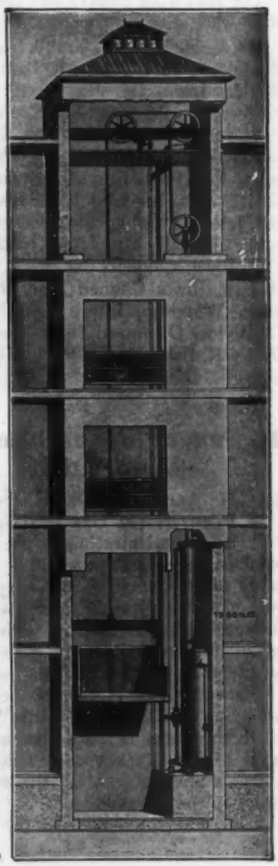
Runs year after year without touching it.
Is as good after years as when new.
Never wears out.
Is absolutely fool proof, can't overload it.
Is perfectly safe all the time.
Goes at any speed "you ask it."
Goes when plant is shut down.
Has no counter weights.
Has no fire danger.
Has no repairs.
Stops level at floors by its very nature.
Costs nothing to run.
Never goes into the overhead.
Has no trifling doo-dads.
Needs no weekly and monthly expert inspection.

Yes, Absolute Perfection.
This and more is what folks get who

"HOOK 'ER TO THE BILER"

Direct Acting

Double Geared



Craig Ridgway & Son Co. Coatesville, Pa.
Over 3,000 in daily use

Mid-West Gas Association

(*Continued from page 84*)

and less by radiation. Moving air, associated with higher floor temperatures and lower ceiling temperatures was the subject around which he developed his discussion.

During the course of the program, reports were made by the Affiliation Representatives, as follows:

Mr. V. O. Stafford, Sioux City, Iowa, Commercial Section Report; Mr. C. F. A. Schuldt, St. Paul, Minnesota, Industrial Section Report; Mr. J. K. Swanson, Minneapolis, Minnesota, Publicity and Advertising Report; Mr. E. G. Bischoff, Davenport, Iowa, Accounting Section Report; Mr. John M. Drabell, Cedar Rapids, Iowa, Technical Section Report; Mr. R. J. Caniff, Chicago, Illinois, Manufacturers' Section Report.

The entertainment features provided this year were excellent in character and unusual in interest, consisting of a Minstrel Show and Dance Monday night and a Banquet Tuesday night. Mayor Leach was the only speaker at the Banquet. He paid tribute to the efficiency and management of the utility corporations which furnish service to American communities today.

The entertainment features were in charge of Mr. J. K. Swanson, Minneapolis, Minnesota, and Mr. Henry R. Schmidt, St. Paul, Minnesota.

The following officers and council members were elected for the ensuing year:

Mr. E. H. Vieregg, Grand Island, Nebr., President; Mr. John M. Drabell, Cedar Rapids, Iowa, 1st Vice Pres.; Mr. John K. Swanson, Minneapolis, Minn., 2nd Vice Pres.; Mr. R. B. Searing, Sioux City, Iowa, Secy-Treasurer.; Mr. W. E. Derwent, Rockford, Illinois, Council; Mr. C. C. Helmers, Lincoln, Nebraska, Council; Mr. James Trimble, Bismarck, North Dakota, Council; Mr. L. W. Wade, Sioux City, Iowa, Council; Mr. R. L. Klar, Des Moines, Iowa, Council; Mr. R. H. Garrison, Waterloo, Iowa, Council; Mr. R. C. Taylor, Ottumwa, Iowa, Council; Mr. Henry R. Schmidt, St. Paul, Minn., Council.

Meeting of Pennsylvania Gas Association

ON April tenth and eleventh the Pennsylvania Gas Association held its annual meeting at the Benjamin Franklin Hotel, Philadelphia, Pa. Upwards of two hundred and fifty gas men from a relatively wide radius were in attendance and were favored with the reading of interesting papers which evoked considerable worth-while discussions.

President Grier Hersh, of the Pennsylvania Gas & Electric Company, York, Pa., called the meeting to order and introduced Mayor Mackey who welcomed the delegates and referred to the value of a Utility to the community.

W. H. Earle, manager of the Philadelphia Coke Company, described in detail the operation of the Koppers ovens which new supplies a considerable portion of gas used in the Philadelphia district. He went on to explain how and why the particular site was chosen for locating this plant and cited some of the factors influencing the choice,—proximity to railroads, accessibility to water, location near center of district to be supplied with gas, etc.

Paul Fusselman, Philadelphia Counties Suburban Gas & Electric Company, went into a complete description of the distribution system supplying gas to his particular territory, amplifying his talk by way of a number of lantern slides. He touched upon such points as number of customers per mile of mains, size and kind of pipe, location of the various gas manufacturing plants supplying his district, number of holders and type, etc.

Mr. Fusselman was asked a number of questions by several of those in attendance and this was particularly so as regards the amount of leakage with various joints and under various pressures of gas.

William Tobias, Division Manager, Central Public Service Corporation, Hagerstown, Md., read a paper dealing with the service to be rendered the customer.

He outlined the meaning of the word service and went on to show how his company had tackled the service problem to the end that the customers had a kindlier feeling toward the company. His paper went into the matter of the proper sizes of house piping very thoroughly and he narrated how small house piping can give rise to many complaints.

Fully an hour was devoted to a discussion of this paper. During this discussion which was indulged in by Messrs. Boyer, Weiser, Ganser, and others, such topics as house heating, refrigeration, cooking, etc., were dealt with. Mr. Boyer recommended that much effort should be put forth to get industrial business that would come on during the night hours.

On the second day of the meeting the following papers and addresses were delivered: "Investment Trusts" by Theodore Grayson, University of Pennsylvania; "Greater and Better Water Heater Sales," by F. L. Mendez, Philadelphia Suburban-Counties Gas and Electric Company; "Cleanliness and Hot Water," by Roscoe Edlund, Cleanliness Institute of New York; "The Gas Company—A Selling Organization," by J. H. Truman, Allied Power and Light Corporation, New York; "New Methods of Meter Reading and Collecting," by Charles L. Hoffman and John T. Good, Consumers Gas Company, Reading.

The following officers were elected:

President, Warren A. Norris, Lebanon Valley Gas Company; 1st Vice-pres., W. F. Swayze, Phila. Suburban Counties Gas & Electric Co.; 2nd Vice-pres., H. P. Duggan, Penn Central Light & Power Co.; Treasurer, L. S. Williams, Harrisburg Gas Company. George L. Cullen was re-elected to his present position.

World Production of Coal in 1928

The world production of coal of all grades in 1928, according to preliminary figures compiled by the Bureau of Mines, was 1,444,000,000 tons. Of this, approximately 217,000,000 tons, or 15 percent of the total output, was lignite, and 1,227,000,000 tons was bituminous coal and anthracite. Lignite production was the largest on record and showed an increase of 9.0 per cent over 1927. The production of anthracite and bituminous coal, however, declined 3.5 per cent in comparison with 1927. Adequate production and stocks characterized the world coal situation throughout 1928.

The production of coal in the United States amounted to 516,629,000 tons in 1928.

STATEMENT OF THE OWNERSHIP, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of American Gas Journal, published monthly at 53 Park Place, New York, for April, 1929.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Stanton G. Krake, who, having been duly sworn according to law, deposes and says that he is the business manager of the American Gas Journal and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher American Gas Journal, Inc., 53 Park Place, N. Y.; Editor H. M. Riley, 53 Park Place, N. Y.; Managing Editor, H. M. Riley, 53 Park Place, N. Y.; Business Manager, Stanton G. Krake, 53 Park Place, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Stanton G. Krake, 53 Park Place, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

Stanton G. Krake.
Manager

Sworn to and subscribed before me this 6th day of April, 1929.

[Seal.] Rovella Bennett
(My commission expires March 30, 1931)

GAS MEASUREMENT ENGINEERING

AMERICAN METER COMPANY
JOHN J. GRIFFIN & COMPANY
HELME & McILHENNY
MARYLAND METER WORKS

Published Periodically by
AMERICAN METER COMPANY
INCORPORATED
Established 1836

D. McDONALD & COMPANY
METRIC METAL WORKS
NATHANIEL TUFTS METER WORKS
PACIFIC METER WORKS

VOLUME 1 — *May 1, 1929* — NUMBER 1

In Explanation

Beginning with this introductory number, *Gas Measurement Engineering* will be published from time to time as a record of noteworthy activity relating to gas meters and allied apparatus.

Illustrations and editorial matter alike are planned to be constructively informative, and will be kept strictly within the scope expressed by the title heading of this publication.

Erie Laboratory Described in New Bulletin

THE Laboratory at Metric Metal Works is constantly producing tangible results that are of practical as well as of theoretical value to measurement engineering. A special bulletin, descriptive of the work being done, has, therefore, been made available to the Gas Industry. It is written by John C. Diehl, Gas Engineer in charge of the Laboratory.

Since the subject is too large for detailed presentation in *Gas Measurement Engineering*, we are giving a mere outline of some of the material covered by this booklet.

"The Erie Laboratory, specializing in large volume, high-pressure measurement, was built in 1912 to enclose a 2200-foot holder or prover. This prover was constructed for the purpose of determining the values of orifice coefficients and for testing large-volume positive or proportional meters. Since then a great deal of new equipment has been added for performing more accurate tests and a greater variety of tests. The building has had to be extended from time to time until it now occupies 3500 square feet—all of this space being devoted entirely to experiment and testing. During 1929 the Laboratory will again be substantially enlarged."

The extent of present equipment and activity is indicated by the outline which follows and by three photographs of the laboratory.

(Continued on next page)

A "Best Seller"

Among the Technical Literature of the Gas Industry

Since the first appearance of the revised edition in 1927, the demand for the Natural Gas Handbook compiled and edited by John C. Diehl and published by American Meter Company through Metric Metal Works has exceeded 3,000 copies.

Although this handbook has been the basic reference authority of the Natural Gas Industry since 1913, the revised edition has greatly enhanced its practical and comprehensive usefulness.

This is attested by the widespread and continuous demand for the book from both Natural and Manufactured Gas Engineers. Its present circulation extends to every country in the world where gas plays a part in industrial activity.

A complete prospectus giving a resume of contents of the Natural Gas Handbook is available by request.

Other Technical Literature for sale by Metric Metal Works:

Pressure Extension Book

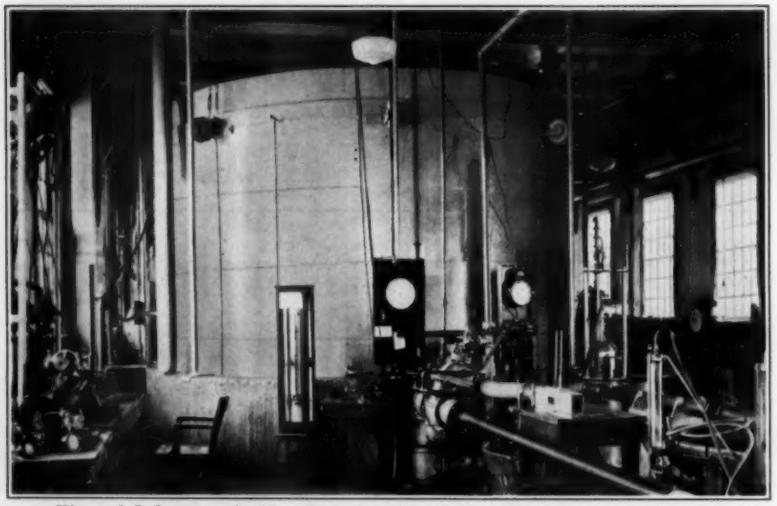
Complete Edition — Size: 8¼" x 16"— 88 Pages — Buckram Binding. Abbreviated Edition—Size: 8¼" x 16"—20 Pages—Flexible Cloth Binding.

Handbook of Casinghead Gas

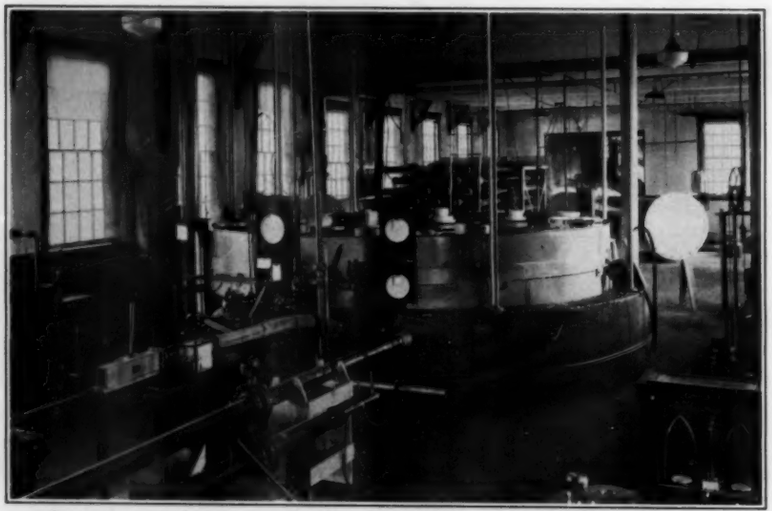
By H. P. WESTCOTT—Third Edition—Size: 5" x 7¾"—642 Pages—Cloth or Leather Binding.

Measurement of Gas and Liquids by Orifice Meter

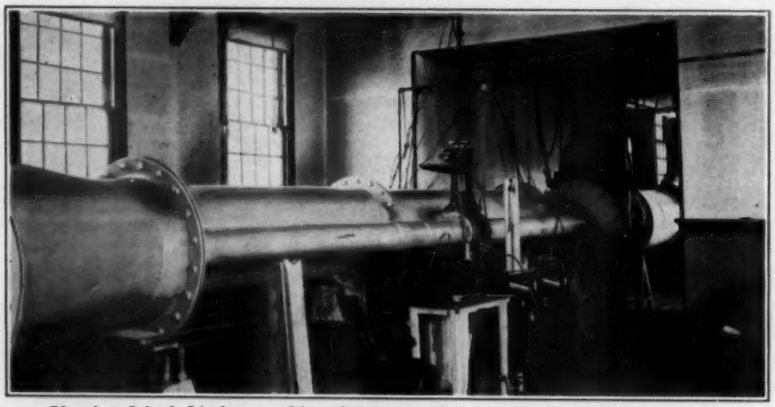
By H. P. WESTCOTT — Assisted by J. C. DIEHL—Second Edition—Size: 5" x 7¾"—434 Pages: 153 Tables: 136 Illustrations—Bound in Cloth or Leather. Also "Measurement of Gases Where Density Changes".



View of Laboratory looking East, showing holder raised, outlet conduit from blower installed above ceiling, water column for balancing pressure, mercury barometers, chronograph, connections at outlet of holder, wet and dry bulb thermometer case, and differential pressure gages.



Same view as above except the bell is lowered showing the weights on top of the bell and the inlet end of the multiple orifice prover.



Showing 8-inch Linderman Meter being tested by the multiple orifice prover and a section of 30-inch pipe which replaces the eight-inch line when testing the 30-inch meter shown in the background.

(Continued from page 1)

(1)—*Air and Power Supply*—

High Pressure lines are capable of delivering 60,000 cu.ft. of air an hour at a pressure of 90 pounds.

A suction fan is issued with a capacity of 1,500,000 feet an hour at10 inches of water vacuum in combination with a multiple orifice prover of like capacity.

Power lines supply 220 volt single phase and three phase A.C. 110 volt single phase A.C., 110 volt and 220 volt D.C.

(2)—*Standards of Measurement*—

For volume, temperature, pressure, specific gravity and time, fundamental standards calibrated by the U. S. Bureau of Standards are used to eliminate as far as possible any constant errors. Equipment includes standardized cathetometers, scales, engineer's tapes, cubic foot bottle, thermometers with microscopic sights, mercury barometers, etc. Scales for length are graduated to be read by vernier to 0.001 inch. All thermometers can be read to 0.01 degree.

Gage pressure is always determined by use of water or mercury U-Gages in which the area of one column of the gage is made 800 times the area of the other column or by means of calibrated draft gages.

Other interesting features of the description are treated in order under these headings:—(3) Precision Desired—(4) Barometric Pressure—(5) Holder Volume Calibration—(6) Holder Pressure—(7) Volume Reading—(8) Holder Temperature Effects — (9) Temperature Vapor Pressure Control—(10) Holder Thermometer Calibrations—(11) Change of Air Volume in Holder—(12) Specific Gravity of Air in Holder—(13) Flowing Temperature — (14) Differential Pressure Gages—(15) The Measurement of Time—(16) Test Procedure—(17) The multiple orifice Prover for Large Volume Orifice Meters.

The Erie Laboratory Bulletin may be obtained by writing to the Metric Metal Works Factory of American Meter Company.

Diaphragm Specialization

As Exemplified by Activities in One Factory

THE careful adaptation of Gas Meter Diaphragms to general working conditions and to individual Gas Company requirements is a matter of specialization in every American Meter Company factory.

To Gas Engineers who have visited D. McDonald & Company at Albany, the diaphragm activities in this factory have been of special interest. It is today the largest single producer of diaphragms in the world, with an annual output of more than one and one-half million diaphragms. This number, added to the production of other American Meter Company factories, makes an impressive figure. Here also the several factories of American Meter Company have concentrated the important phases of research relating to diaphragms and diaphragm oils.

The centering of this work in one place enables close observation and accurate records of the performance of diaphragms under the varying conditions which the Gas Industry offers. It makes possible a full realization of the long and practical experience possessed by the individual factories of American Meter Company.

Diaphragm Specialization along the lines indicated is based on sound and progressive manufacturing policy. It makes accessible to Gas Companies the fullest measure of co-operation in ascertaining the actual facts relating to diaphragms in service.

The accompanying photographs illustrate certain phases of diaphragm manufacture in the D. McDonald & Company factory. The top picture shows the diaphragms being cut from special vegetable tanned sheep skin and pasted. The center photograph pictures diaphragms being sewed. In this and other departments rigid inspection takes place. The bottom picture illustrates the winding of diaphragms on the rings.

Keeping Descriptive Literature Up-to-date

SINCE the publication of Catalogue G-1 for 1929 several clarifications and additions have already been made for inclusion in future publication.

The more important of these will be noted from time to time in *Gas Measurement Engineering*. All changes thus recorded will refer to corresponding pages of the 1929 Catalogue now in use. In this way, the General Catalogue may be kept completely serviceable until the appearance of the next issue.

As the need arises, certain sections of the Catalogue will be reprinted in revised bulletin form for the benefit of customers who are not interested in the entire line of products manufactured by American Meter Company but desire information on specific items such as Gauges, Thermometers or other departmental requirements. Any new bulletins will be announced and outlined in this publication on pages reserved for this purpose.

The basic installation of an 8-inch Linderman Orifice Meter showing also the integrator

Additions or Changes Affecting General Catalogue G-1, 1929

Large Volume Measurement by Linderman Orifice Meter

Pages 92 to 97 General Catalogue

WITH particular reference to the 6, 8, or 12 inch Linderman Meter—information relating to its adaptability to the engineering requirements of each particular installation was not brought out in the General Catalogue description.

This feature of flexible utility is made possible by the fact that anyone or all of four additional devices may be added to the basic installation to adapt this meter precisely to the conditions which the installation is required to meet.

The basic installation is the automatically changing orifice with a recorder and integrator for reading the registration.

The following devices may then be added to adapt the installation to operating requirements:

The Specific Gravity Device
The Pressure Device
The Temperature Device
The Temperature and Pressure Devices Combined.

These four additional devices are the same for the three smaller sizes of Linderman Meter and are individually priced. A customer may, therefore, build up an apparatus which will be adaptable to his individual requirements.

In the 16, 22 and 30 inch Meters the integrator and controller are adapted to these larger sizes and the meters are furnished completely equipped with devices.

NOTE: The combined temperature and pressure device can only be used where the percentage variation of the absolute pressures is comparatively small, as in the case of very low pressure distribution in the neighborhood that is of 20 inch water column.

SIZES AND CAPACITIES IN STANDARD CUBIC FEET PER HOUR

Pipe Size	*Low Pressure	*High Pressure
6	0 to 45,000	0 to 150,000
8	0 to 90,000	0 to 300,000
12	0 to 200,000	0 to 700,000
16	0 to 350,000	0 to 1,300,000
22	0 to 800,000	0 to 3,000,000
30	0 to 1,250,000	0 to 4,500,000

*Anything above 15 lbs. per square inch is considered high pressure.
The capacities given for low pressure meters are at 2 lbs. per square inch.
The capacities of high pressure meters given are for pressures of 50 lbs. per square inch.

The Linderman Meter will be exhibited at the Annual Convention of the Natural Gas Department of the A.G.A. meeting in Kansas City from May 6 to May 10.

Standardize on Mueller Stops

Mueller G 11007 Flat head service Stops

Mueller G 11026 Flat head service Stops

An installation of Mueller Gas stops — either brass or iron body with brass keys —will convince you of their service giving dependability.

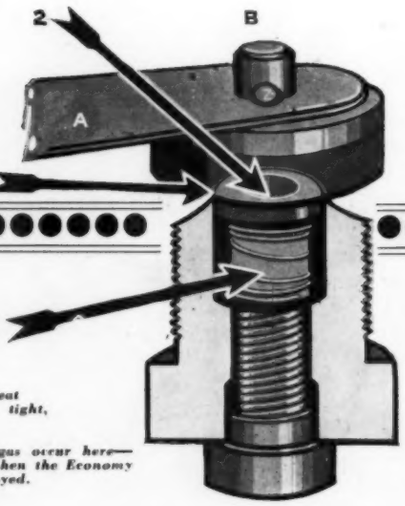
Standardize on Mueller gas stops now as hundreds of others have done and eliminate costly service failures.

Mueller Laboratory control of materials from raw metal to finished product reinforced by careful workmanship, systematic inspection and our more than 70 years knowledge of gas service needs enables us to produce a quality of stops satisfying your requirements.

Our complete catalog of gas and water service goods sent you on request. Estimates willingly given on your 1929 needs.

MUELLER CO. *(Established 1857)* **Decatur, Illinois**
Branches: **New York, Dallas, San Francisco, Los Angeles**
Canadian Factory: **MUELLER, Limited, Sarnia**

MUELLER



1 — Arrow shows where deposits occur on valve, directly above seat, when "No-Blo" unit is not employed, causing the valve to seat imperfectly, instead of closing tight, "Weeping Seals" result.

2—Deposits from flowing gas occur here—directly above the inlet orifice—when the Economy Governor "No-Blo" unit is employed.

3—Sliding No-Blo sleeve, upper surface of which is even with valve seat.

A—Spring Strip, of monel metal—attached to valve removal plate—and holding valve in place.

B—Shows extremely simple and easy insertion of new valve leather, simply by removing cotter pin (Z) taking out old valve leather, putting in new one, and replacing cotter pin, all of these operations being done with entire mechanism out in repair man's hands.

NO-BLO ··· THE ONLY PROTECTION AGAINST SEAL-BLOW AND WEEPING

THE No-Blo Valve—exclusive to the Economy Service Governor—has been tested by pioneers in high-pressure distribution, and has definitely and conclusively proved its ability to eliminate deposits on the seat, which cause a build-up of pressure resulting in the blowing of the seal or in slow leakage loss through "weeping."

Deposits on the leather valve are made directly above the orifice in the No-Blo Sleeve, instead of above the seat-ring—thus preserving a clean surface on the leather valve for positive contact with the seat.

Before the development of the No-Blo Unit there was no effective protection against blowing of seals or "weeping." Nor is there any other valve affording this protection, now.

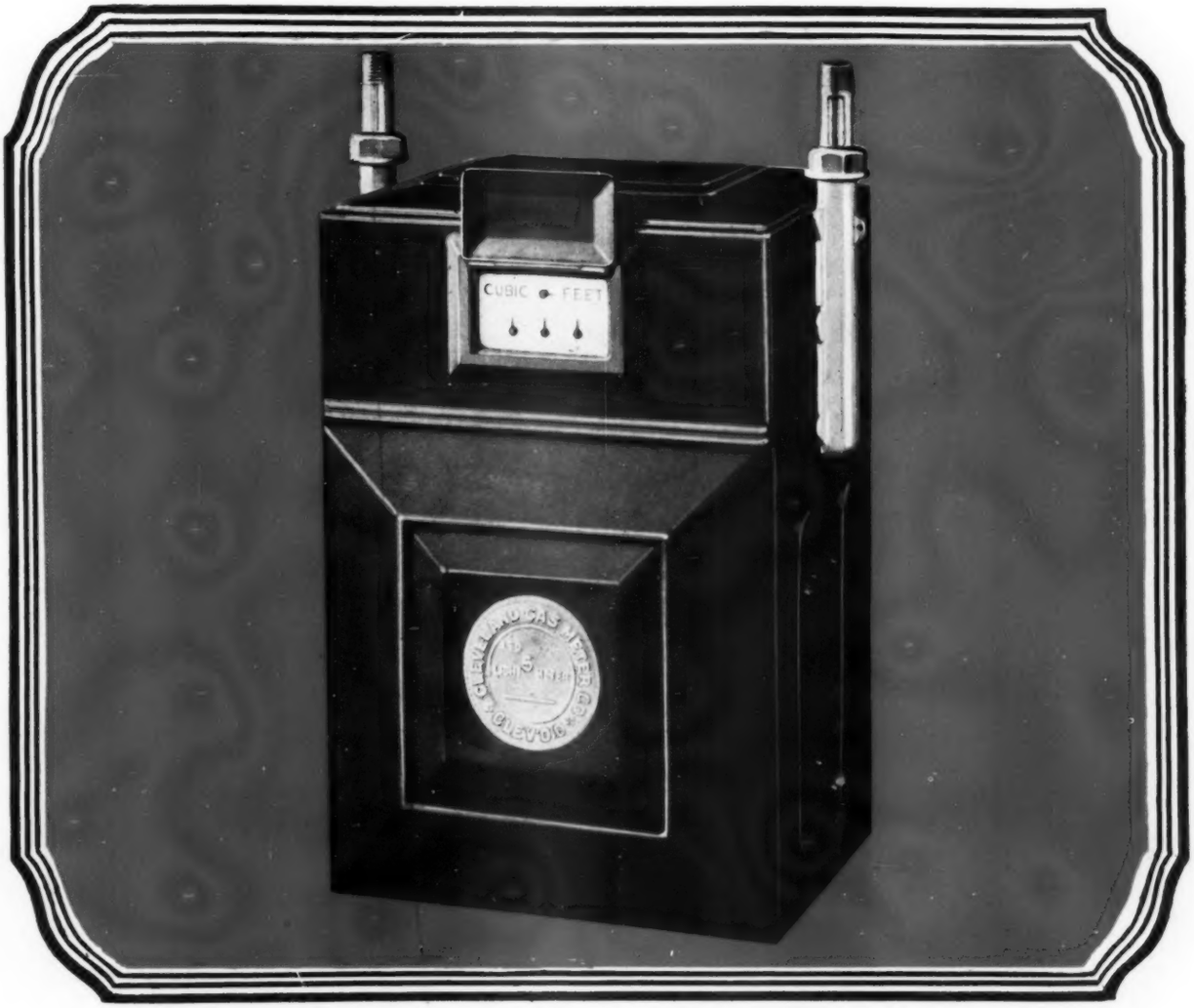
ECONOMY GOVERNOR CO.

ANDERSON, INDIANA

EASTERN REPRESENTATIVES:

MULCARE ENGINEERING CO.

100 Park Place, New York City



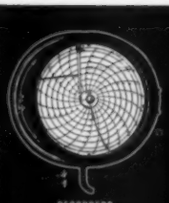
Cleveland Gas Meters have a reputation for dependable service, the result of over thirty years' experience in manufacturing.

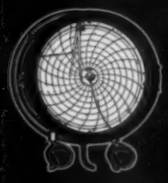
Our thoroughly organized and completely equipped factory assure you that the workmanship, materials, accuracy and general efficiency are unequaled.

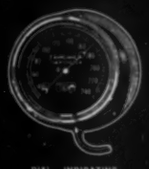
"A" Type Meters "B" Type Meters

THE CLEVELAND GAS METER COMPANY

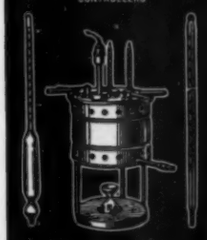
2168-2180 East 65th Street **Cleveland, Ohio**

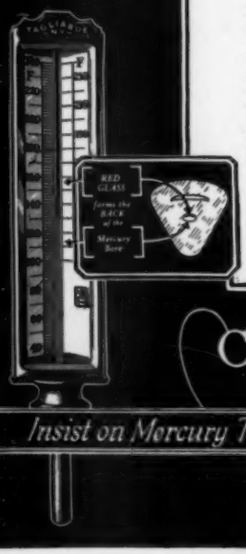

RECORDERS

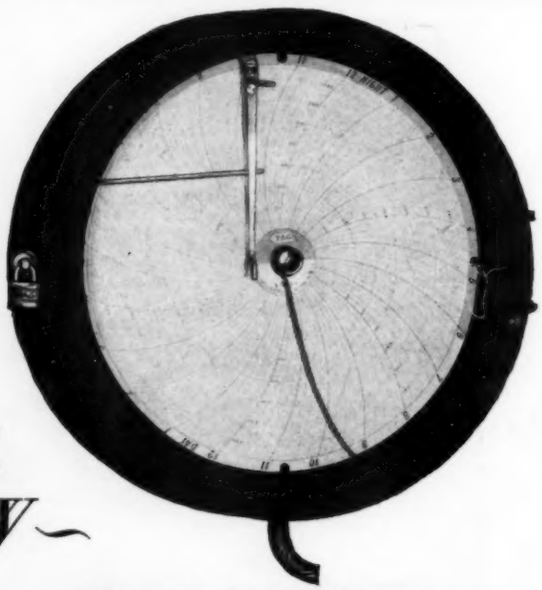

RECORDER - CONTROLLERS


DIAL - INDICATING THERMOMETERS

AUTOMATIC CONTROLLERS


OIL TESTING INSTRUMENTS, THERMOMETERS, HYDROMETERS, ETC





And NOW—

TAG ROUND FORM

Temperature and Pressure Recorders

Here is the same principle that has won success in so many cases you know of —"We couldn't improve the product, so we improved the package."

IN this case — the "package" is the protective Recorder case. Responding to the demand of engineers who like to see and use uniform panel boards, we now introduce the same famous TAG Recorders in Round Form.

There has been no change in the reliable time-tested TAG Recorder mechanism. The same accuracy which has safeguarded truthful written records of temperature, pressure, vacuum, humidity and operation-time over a decade of industrial usage is still unfailingly present.

The design of the new case, however, is such that it can be produced with distinct economies which have been passed on to you.

If you insist upon the high standard of accuracy and durability which TAG Recorders have always provided, you can now have them less expensively and in the improved manner.

Remember — The same old TAG Recorder accuracy in a new handsome, uniform case and at a price which will make it additionally pleasant to have the best.

Write for Bulletin No. G977—It tells the whole story. . . . . Ask for prices too . . . . they will interest you.

C. J. TAGLIABUE MFG. CO.

18 TO 88 THIRTY-THIRD ST., BROOKLYN, N.Y.

Insist on Mercury Thermometers with the TAG-Hespe RED Reading Column

SINCE 1769

TAG C. J. TAGLIABUE Mfg. Co. BROOKLYN

THE KOMPAK CO.

Automatic Thermostatic Gas Water Heaters

NEW BRUNSWICK
NEW JERSEY

The History of Automatic Storage Water Heating is the Story of the Kompak.

No wonder that today the product of the Kompak is at the very forefront in quality and service. Backed by the ablest engineering skill in the industry, every basic and radical improvement has been introduced and perfected by Kompak.

In the long hard grind, the highest quality only will survive.

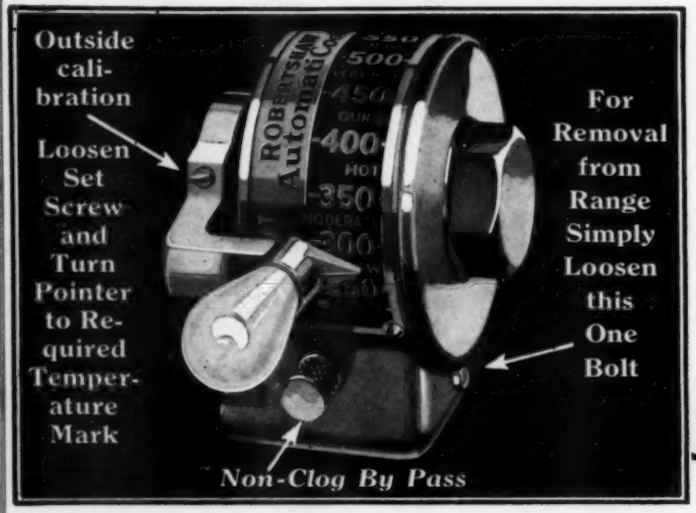
Yours very truly,

THE KOMPAK COMPANY

H. J. Long,
President.

KOMPAK

GAS COMPANIES and STOVE DEALERS



Appreciate the Exclusive Advantages of the "B" Type

ROBERTSHAW AutomatiCook

Outside Calibration. Takes just a few seconds to change the temperature setting if required, by means of a convenient set-screw on the temperature pointer. Merely loosen the set-screw, move the pointer to the proper temperature mark on the dial, and then tighten the set-screw.

Quick Removal. Should the "B" Type AutomatiCook become damaged for any reason, necessitating replacement, it can be removed without disconnecting the range or disturbing the linings or the piping. Requires no mechanical servicing or repairs on the job. Simply loosen one bolt, replace the Thermostat with a spare and tighten the bolt. The job can be done in less than a minute's time.

Non Clog By-Pass Pilot. Will not clog nor bind. Always moves freely and maintains its adjustment. Eliminates servicing, adjusted by turning either to the right or left.

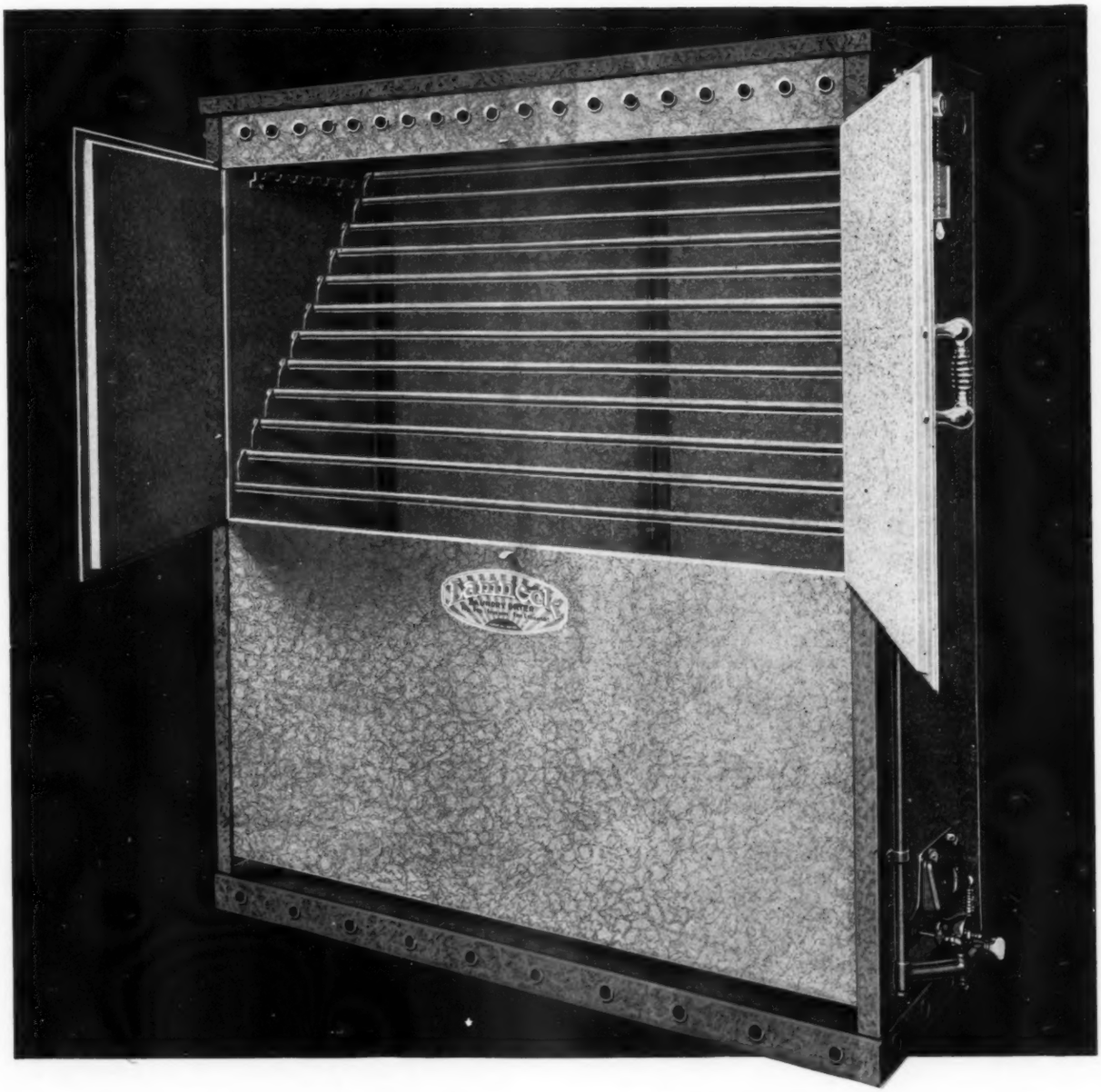
Non-Corrosive Valve Seat. The AutomatiCook is now being equipped with a Raised Non-Corrosive Valve Seat which will resist the corrosive action of gas, eliminating any possible trouble from this source.

Write for 8-Page Folder, illustrating and describing the above advantageous features.

ROBERTSHAW THERMOSTAT CO.

Youngwood, Penna.

The Robertshaw AutomatiCook is now used on more than 80 leading makes of Gas Ranges



FINISHED IN COLORS!

KEEPING step with the modern trend for color, LAMNECK presents a *new* dryer— at no increase in price. Covering the cabinet, inside and out, is a rich, crackle finish of oven-baked, grey enamel trimmed in bright green. You know what remarkable success the LAMNECK LAUNDRY DRYER met with in its old dress—but think of the sales stimulus this *new* finish will create. Gas companies who are now selling LAMNECKS are going to sell *more* LAMNECKS—and the few who are not will never have a more opportune time to begin.

THE W. E. LAMNECK COMPANY
444 Dublin Avenue **Columbus, Ohio**

The first advertisement in the ten-years-old National Advertising Campaign of the Lorain Oven Heat Regulator appeared in the May, 1919, issue of Good Housekeeping. Since that memorable date 1,000,000,000 separate Red Wheel Gas Range advertisements have been delivered into the homes of America!

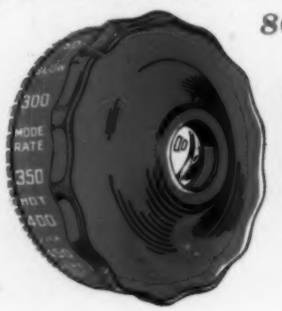
This individual effort on the part of American Stove Company eclipses the combined efforts of all other manufacturers of gas appliances and is, therefore, worthy of the attention of everyone engaged in the gas and gas appliance industries.

DID women really dress like those we see above (left) only ten years ago? Certainly! Did gas ranges have so little enamel on them only ten years ago? Absolutely! ¶ Did any gas range manufacturer maintain a Research Laboratory or a Research Kitchen in those good old days? Or advertise nationally in a large way? Or offer worth-while sales-assistance to dealers? Not that anybody can remember! Not until the advent of Lorain and the National Advertising Campaign that "put it over" did the gas range begin its rapid march toward popularity and efficiency. Who will keep it there? In the future, as in the past, American Stove Company pledges more than its fair share.

AMERICAN STOVE COMPANY

801 Chouteau Avenue • • • • St. Louis, Mo.

LARGEST MAKERS OF GAS RANGES IN THE WORLD



LORAIN RED WHEEL

These are the Six Famous Brands of Red Wheel Gas Ranges:

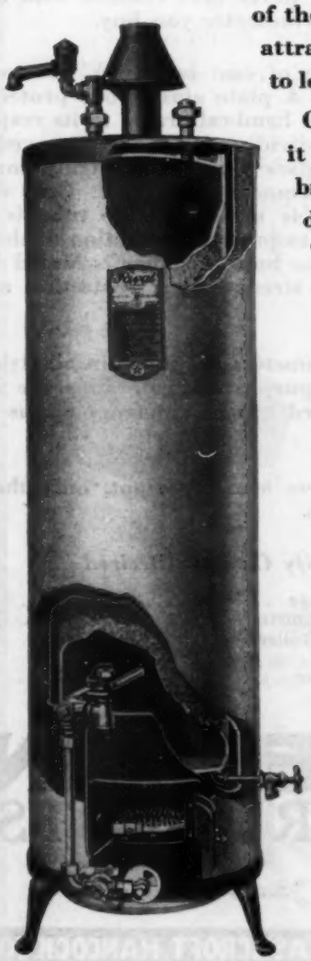
DANGLER · CLARK JEWEL · QUICK MEAL
DIRECT ACTION · NEW PROCESS · RELIABLE

Meet the *Rival* at Kansas City

WHILE making the rounds at the Natural Gas Convention this month, don't fail to stop at Booth No. Seven and get acquainted with the Rival Automatic Storage Water Heater.

"See you at Booth No. Seven"

The Rival is a heater of the popular self-contained type. Designed to give genuinely automatic service, and built to last for years, it is yet definitely an inexpensive article. In handling the Rival, you enjoy the advantage of selling a gas water heating system of the most efficient order at a price low enough to attract a large group of customers and high enough to leave room for a handsome margin of profit.



Characteristic features of the Rival which make it outstanding in its price class are: the ¾-inch brass union hot and cold water connections; the double extra heavy welded copper bearing Steel Tank, galvanized with virgin spelter; the Rockwool insulation, 1⅝ inches thick; the three-piece cast iron combustion chamber, made to withstand heat and corrosive action; the Bunsen-type Dual burner; the snap-action thermostat and gas safety patrol valve, which actuate the Rival and give it the safest and most efficient method of gas flow regulation. Each of these is a persuasive selling point.

At Booth No. Seven you can also see the Rex Automatic Storage Heater, as fine a heater as money can buy; the Rex Tank Heater, a standard unit at a popular price; the Rex-Patrol Automatic Water Heater, a low-priced automatic, attachable to any range boiler; and a score of other interesting items. Be sure to visit

Booth No. Seven

The Cleveland Heater Co.

1900 West 112th Street **Cleveland, Ohio**

FULTON DUPLEX
Sensitive
GAS GOVERNOR

CF

for high pressure transmission

This governor is designed to meet the needs of artificial and natural gas companies who desire to control a high and varying inlet pressure and reduce it to a low and unvarying outlet pressure, for illuminating or fuel purposes.

The materials used in its construction are resistant to the chemical action of all manufactured gases; all frictional surfaces are eliminated, and the diaphragm surface is increased by the use of two diaphragms, thus giving it vastly greater sensitiveness and power over governors equipped with but one diaphragm.

The Fulton Gas Governor is easily and quickly installed and requires a minimum of attention afterward.

Write for complete Catalogue

The Chaplin-Fulton Mfg. Co.

28-40 Penn Ave. Pittsburgh, Pa.

WHEN TEMPERATURES ARE IMPORTANT

Only the Best Thermometer Pays

THE American Industrial Thermometer is accurate. When requested, a test certificate is issued with each thermometer, which assures its accuracy by comparison with a U. S. Bureau of Standards Certified Thermometer. Never guess at temperatures and never take chances with the accuracy of the thermometer you buy.

The case is made of cast brass, "V" shaped, all black enameled. A plate glass front protects the scale. The scale is hand-calibrated to its respective tube and the subdividing lines are engraved (not stamped). The glass tube is thoroughly annealed for 6 days for permanent accuracy. Only double distilled mercury is used, and the tube is filled with nitrogen gas to prevent separation of the mercury column. The bulb chamber is Monel Metal, giving maximum strength and protection against corrosion.

American Thermometers are made in all styles for every individual purpose. Scale sizes are 7", 9" and 12". Standard ranges are from minus 40 to 1000° F.

When temperatures are important, only the best thermometer pays.

Specify Catalogs Desired

Gas Maker's Gauge	P-7
Recording Thermometer	H-7
Temperature Controller	R-7
Recording Gauge	E-7
Glass Thermometer	F-7

AMERICAN INSTRUMENTS

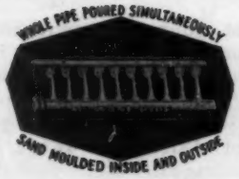
Since 1851

CONSOLIDATED ASHCROFT HANCOCK CO. INC.
Subsidiary of Manning, Maxwell and Moore, Inc.
100 East 42nd Street, New York City

Please ~ Pass the Salt

Too much or too little salt will ruin a bowl of oatmeal. Exactly the same thing is true of tensile strength in cast iron pipe.

McWane Pipe has a very high tensile strength—over 30,000 pounds per sq. in. But what is far more important —it has the proper balance of strength with softness.



This is due to the method of casting in the McWane foundries. McWane Pipe has ability to bend and yield, thus preventing breakage. It is a fine grained, soft, gray-iron casting, easy to cut or tap.

Write for particulars.

WRITE FOR ILLUSTRATED LITERATURE

McWANE CAST IRON PIPE CO. BIRMINGHAM, ALA.

PACIFIC STATES CAST IRON PIPE CO. PROVO, UTAH

SALES OFFICES IN PRINCIPAL CITIES

McWANE

CAST IRON PIPE

Tycos Gas Leak Indicators

Are a quick and efficient means of locating gas leaks. As soon as the gauges show a leak somewhere along the line, it may be traced by driving small holes along the main and using one of these Indicators. The hand will indicate the place of greatest flow and the leak may be then fixed.

Instruments indicate the presence of either heavy or light gas.

***TYCOS* Gas Leak Indicator No. 3405**

Comes completely equipped in sole leather carrying case with strap, weight about 1¾ pounds.

***TYCOS* Gas Leak Indicator (Vertical form)**

Improved type, vertical form. In sole leather carrying case with strap, weight about 1¾-pounds.

Write for additional information and TYCOS Gas Catalog.

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

Canadian Plant
Tycos Building
Toronto

Manufacturing Distributors
in Great Britain
Short & Mason, Ltd., London

for Dress-suit Cellars

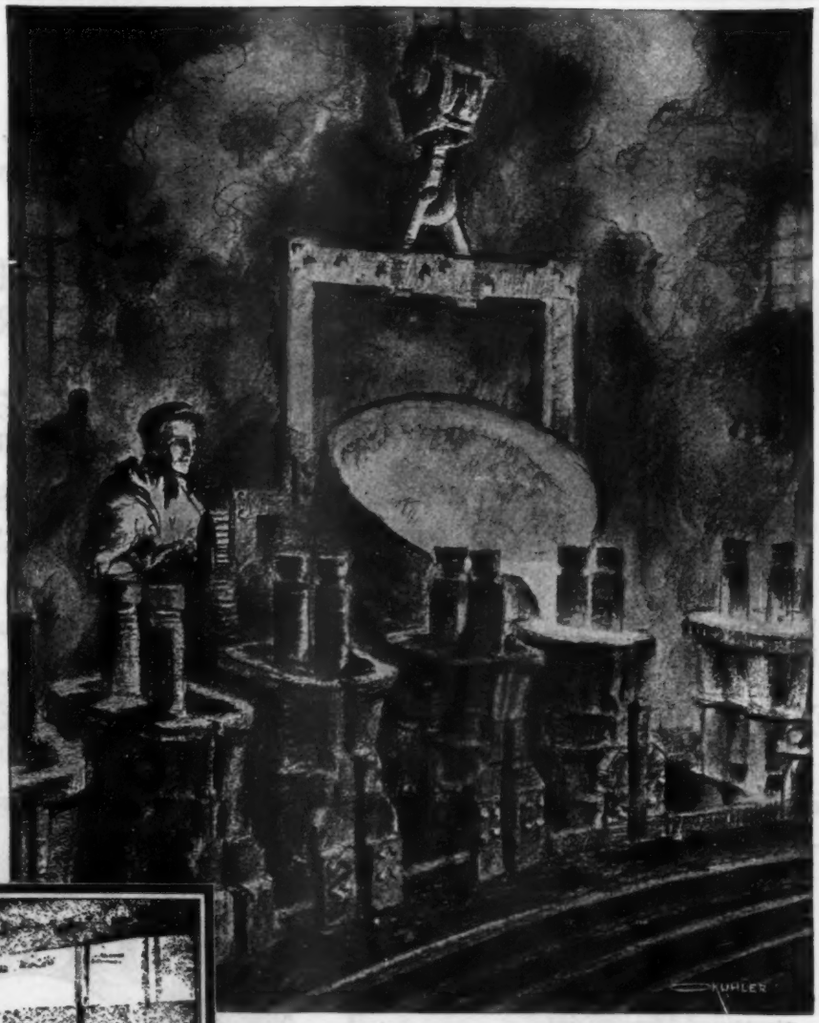
RED Jackets on the boilers, linoleum on the floors, ping pong sets next to the oil burner—a man really ought to don a dress suit to tend his own furnace in these days of fancy basements. And the water heater must be as handsome as the grand piano to keep from striking a sour note in the ensemble.

But your customers need never worry about fashions in heaters when once you sell them a Welsbach Torrid Zone. It holds its place in the best water heater society with ease and distinction. It's a handsome looking job with its smooth, graceful lines and its shining coat of colorful lacquer. Not only easy to look at but another example of "handsome is as handsome does." For Welsbach as the maker guarantees the materials and design of every part.

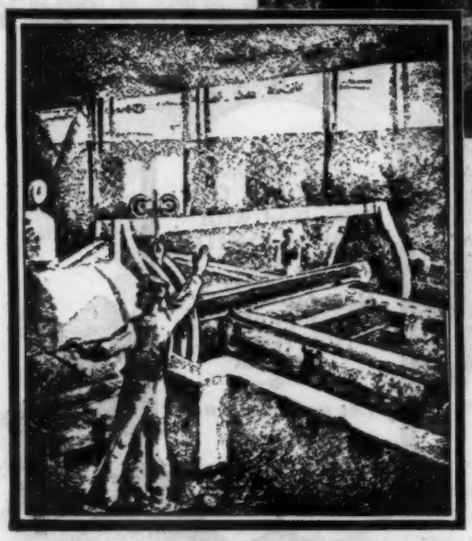
You can exhibit a Welsbach Torrid Zone with pride in its appearance and confidence in its splendid design. Write us for full information. *Welsbach Company, Gloucester City, N. J.* Offices in principal Cities.

Member of the American Gas Association

Welsbach TORRID ZONE



Every length of cast iron pipe must pass a severe hydrostatic test as shown below. The pipes are brought into a testing press, sealed at each end and pumped full of water at a pressure as high as 300 lbs. per sq. inch according to the size of pipe.



CAST Q IRON

The "Q-check" symbol shown above has been adopted as the trade mark of The Cast Iron Pipe Research Association. Insist on this "Q-check" mark when specifying cast iron pipe for gas, water, sewer, or industrial service.

For complete information write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago.

NOWHERE is scientific control more in evidence than in the foundries of modern cast iron pipe manufacturers. Today, for example, the percentages of carbon and phosphorus necessary to produce greatest strength are known and accurately controlled. Today, the pouring and cooling rates of cast iron pipe are checked with extreme care, and the thickness and diameter of every pipe are tested with precision instruments. It is a noteworthy fact that the manufacture of cast iron pipe today claims a leading place in the ranks of *modern* American industry.

* * *

The Cast Iron Pipe Research Association is a service organization of leading pipe founders, formed to promote the scientific improvement and proper use of Cast Iron Pipe. Pipe bearing the Association "Q-check" mark may be obtained from the following: American Cast Iron Pipe Co., Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Ave., Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Co., Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Cast Iron Pipe & Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Company, 11 Broadway, New York City.

CAST IRON PIPE

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD, has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

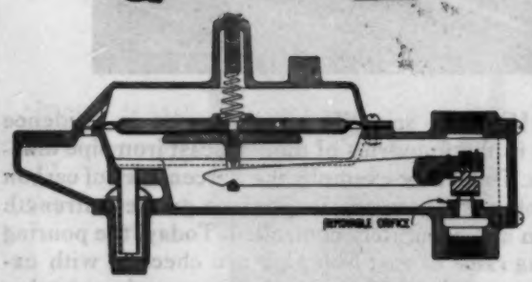
are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE!

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY
1439 BRANDYWINE STREET - - - - - PHILADELPHIA, PA.

GROBLE REGULATORS & GOVERNORS



FEATURES IN GROBLE'S ARE WORTHY OF YOUR MOST SERIOUS CONSIDERATION.

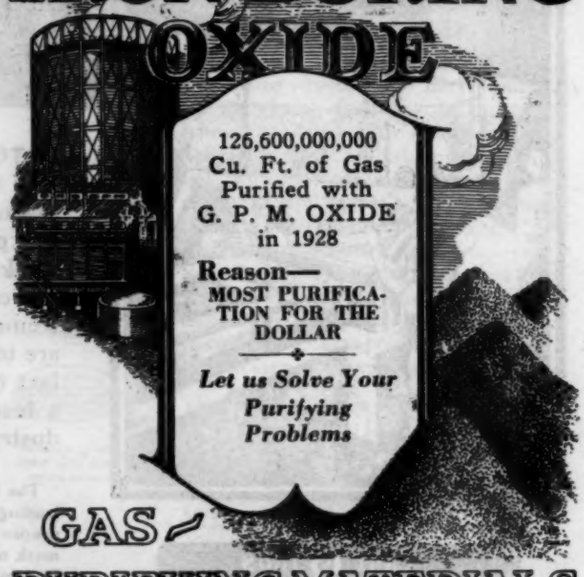
Accessibility of valve.
Removable orifice.
Simplicity of complete repair while in service.

These items improve pressure regulation and lower maintenance cost.

GROBLE GAS REGULATOR COMPANY
Anderson, Indiana

Representatives
Utilities Service Co., Peoples Gas Building, Chicago.
H. E. Broughton, 404 Donovan Building, Detroit.
Midland Supply Co., Dwight Bldg., Kansas City, Mo.
Seidenglanz & Co., Second Unit, Santa Fe Bldg., Dallas.
Fagan-Andrews Co., 135 Michigan St., Milwaukee

IRON BORING OXIDE



126,600,000,000 Cu. Ft. of Gas Purified with G. P. M. OXIDE in 1928

Reason— MOST PURIFICATION FOR THE DOLLAR

Let us Solve Your Purifying Problems

GAS PURIFYING MATERIALS COMPANY INC.

FOOT OF HALSEY STREET - - - - LONG ISLAND CITY
NEW YORK
BRANCH YARD—PROVIDENCE R.I.

Long lengths for quick economical construction. Satisfactory weldability for the same reason. The strength of *seamless*, flawless steel for dependable operation under high pressure and for long trouble-free service. Scale-free walls for maximum resistance to corrosion and minimum resistance to free flow in the line.

These are the qualities good line pipe outstandingly should possess. They are the qualities Pittsburgh Seamless steel line pipe *outstandingly does possess*. Space is too limited here to go into detail about grain structure, steel quality, steel analysis and process of manufacture as these things concern Pittsburgh Seamless steel line pipe, but a letter will bring you full information.

High carbon and other special analysis steels are available.

Pittsburgh Seamless *Is Safe*

Pittsburgh Steel Products Co.

DIVISION OF

Pittsburgh Steel Co.

Pittsburgh Pennsylvania

Drill Pipe *Casing* *Oil Well Tubing* *Line Pipe*

ST. LOUIS NEW YORK DETROIT CHICAGO HOUSTON TULSA

Largest Manufacturers of Seamless Steel Pipe and Tubing Exclusively

The PERCO WASHER

"A necessity in every home"

Hold and Increase the Laundry Load

The Perco Washer will hold and increase the laundry load. It is particularly valuable as an entering wedge for other laundry appliances.

Wherever the Perco Washer is marketed, it is having large sales. What appeals to women is the fact that it saves clothes, time and labor; it has no mechanical action.

The Perco Washer sells with one demonstration.

In the Perco Washer, hot soapy water is automatically sprayed over the clothes. By suction it is drawn through every fiber of the fabric, thus completely cleansing and sterilizing them. The usual time required for an average wash is 30 minutes of steady percolation. The washer is made in two sizes. The smaller uses 15 cubic feet of gas per hour and the larger 25 cubic feet.

Retail Price

Small size (Capacity 6 lbs. dry wash), $13.50
Large size (Capacity 15 lbs. dry wash), $18.50

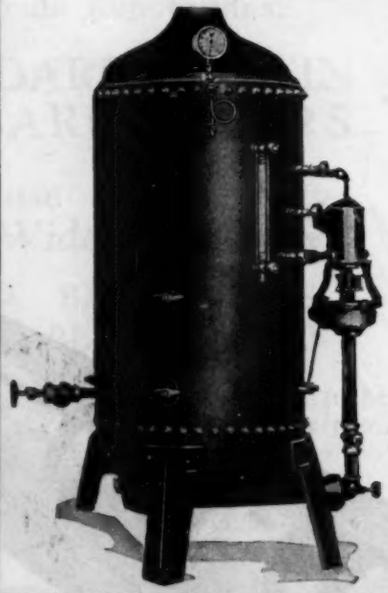
Send for literature

Perco-Steril Machine Corp.
22 East 41st Street. New York City

LATTNER

GAS FIRED

BOILERS



¾ to 30 H.P.
High Pressure

High and Low Types

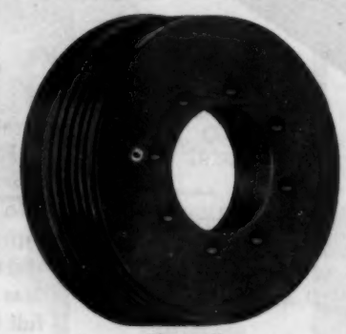
Automatic Controls

Automatic Water Feed Systems

Efficient

P. M. Lattner Mfg. Co.
Cedar Rapids
Iowa

Clark Industrial Burner Tips



(Patented)

Industries, in which gas is the fuel, employ these tips in various gas capacities, and forms adapted to specific needs.

Low pressure fan blast systems adopt this type because of the dependability and endurance of lava.

Made in 15, 30, and 45 cubic foot capacities to fit standard reducing couplings.

We invite correspondence.

American Lava Corporation
29-59 William St. Chattanooga, Tenn.
Manufacturers of Lava Tips & Heat Resistant Insulators

You can make a real saving with this pipe-

Made in Double Random Lengths

ACCURATELY FINISHED ENDS GOOD JOINTS

FEW JOINTS LESS LABOR

"NATIONAL"

HERE is a definite saving to gas companies, of time, labor and joint-making materials in the laying of mains. Approximately one-half the ordinary number of joints are eliminated by using double length pipe. Another advantage of importance is that the possibility of leakage is greatly reduced and an all around better line is obtained.

Because of its high tensile strength, uniform structure and good welding qualities, "NATIONAL" Pipe also assures a strong, sound, dependable line from end to end—note the illustration: A number of lengths of "NATIONAL" Pipe may be first welded, then rolled and lowered into the trench—a test that demonstrates the strength and quality of the pipe. Ask for Bulletin No. 26.

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

***Subsidiary of* United States Steel Corporation**

TIME-O-STAT CONTROLS *at the* Natural Gas Convention

Many new developments and improvements in automatic gas control have become a part of the Time-O-Stat line since our consolidation early this year. Instruments incorporating these important advantages will be shown for the first time at the Kansas City Natural Gas Convention in Booths 247-248, May sixth to ninth.

We are sure you will be particularly interested in our new and greatly improved Electric Gas Valve, as well as in our new Conversion Burner Safety Pilot. The Time-O-Stat Temperature Regulators will also form an integral part of this display.

Adequate and reliable automatic control is essential to the successful application of gas-fired domestic and industrial equipment. Be sure to see the Time-O-Stat exhibit, for we manufacture the most complete line of automatic controls in the field.

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

Successor to
Absolute Con-Tac-Tor Corporation
Time-O-Stat Corporation
Cramblet Engineering Corporation
Leachwood Company

Manufacturers of AUTOMATIC CONTROLS *for*
Oil Burners - Gas Burners - Electric Refrigerators - Mechanical Stokers - Furnace Fans
Industrial Ovens - Ice Machines - Unit Heaters - Water Heaters - *Also* Sign Flashers
Mercury Switches - Electric Heaters - Corrugated Metal Bellows

Save On Your Handling Costs ··· By Using Naylor Pipe

LIGHT weight pipe can be handled quickly, easily — and at lower costs. This holds true from the time it is first claimed at the railroad siding — every step of the way — up to and including erection.

And light weight is one important advantage of Naylor Pipe.

Naylor Pipe, size for size, pressure for pressure, weighs only half as much per running foot as standard weight wrought pipe. This assures greater speed in handling. Less labor means lower costs.

Why not let this light weight feature of Naylor Pipe reduce pipe costs in your pipe line service? Many prominent companies are already doing so. Send for a sample length of Naylor Pipe.

Unlike ordinary pipe, Naylor Pipe is made of Toncan Iron (an alloy of Iron, Copper and Molybdenum). Thus, it has a far greater resistance to rust and corrosion — and consequently, longer life.

NAYLOR PIPE CO.

Main Office and Plant:
1230 East 92nd St. Chicago

Sales Offices:

New York — 25 Church St.
Philadelphia — Witherspoon Bldg.
Tulsa — 507 Philtower Bldg.
Detroit, 1500 Cadillac Square Building

Ducommun Corporation
Los Angeles — San Francisco

Exclusive Distributors:
California — Arizona — Nevada and Utah
Montreal, Canada:
Mechanical Equipment Company
New Birks Building

TONCAN
Naylor Pipe
Mo-lyb-den-um
IRON

Standardized Naylor Pipe is made in sizes 6" to 12" in standard 20 ft. lengths or special lengths up to 40 ft. Made with 5 types of pipe ends to wrought pipe standards for 5 types of joints.

Where corrosion resistance is not a factor, Naylor Pipe can be furnished in steel.

Toncan Copper Molybdenum Iron is a development of Central Alloy Steel Corporation, the world's largest and most highly specialized alloy steel producers. It possesses a superior corrosion resistance, making it the favored pipe material.

Buyers' Reference Index

See page 121 for advertisements of these products

A. B. C. SELF CLINKERING GRATES
The Western Gas Construction Company.

ABSORBERS
Aluminum Co. of America

ACCUMULATORS—STEAM
The Gas Machinery Co.
Ruth's Steam Accumulator Co.
A. O. Smith Corp.
Smoot Engineering Corp.
The Western Gas Construction Company.
United Engineers & Constructors, Inc.

ACETYLENE
The Prest-O-Lite Co., Inc.
Oxweld Acetylene Co.

ACETYLENE EQUIPMENT
American Lava Corp.
Alexander Milburn Co.

ACCOUNTING MACHINES
Remington Rand, Inc.

AIR FILTERS
Staynew Filter Corp.

ALUMINUM PAINT
Aluminum Co. of Amer.

AMMONIA CONCENTRATORS
Bartlett Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
John S. Unger.
The Western Gas Construction Company.

AMMONIA CONCENTRATED LIQUOR PLANTS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.

AMMONIA PIPE
National Tube Company.

AMMONIA RECOVERY APPARATUS
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

AMMONIA STILLS
Bartlett-Hayward Co.
Cruse-Kemper Co
The Gas Machinery Co.
Isbell-Porter Company.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
John S. Unger.
The Western Gas Construction Company.

AMMONIA TEST
American Meter Co.

APPRAISALS & INVENTORIES
Stacey Bros. Gas Construction Co.
United Engineers & Constructors, Inc.

APPARATUS
Laboratory Experimental
American Meter Co.
Service
American Meter Co.

ASH STORAGE BINS
C. W. Hunt Co., Inc.
Semet-Solvay Engineering Corp.
Riter-Conley Co.
The Stacey Mfg. Co.

AUDITS
United Engineers & Constructors, Inc.

AUTOMATIC CONTROLS FOR WATER GAS APP.
United Engineers & Constructors, Inc.

AUTOMATIC RAILWAYS
C. W. Hunt Co., Inc.

BACK PRESSURE VALVES
Connelly Iron Sponge & Governor Co.

BACKRUN GAS EQUIPMENT
Semet-Solvay Engineering Corp.

BAGS
Safety Gas Main Stopper Co.

BAROMETERS
Connelly Iron Sponge & Governor Co.
Consolidated Ashcroft Hancock Co., Inc.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies

BENCHES
Improved Equipment-Russell Engineering Corp.
Isbell-Porter Company.
The Gas Machinery Co.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

BENZOL
Bartlett-Hayward Co.
Indugas, Inc.
The Koppers Construction Co.

BENZOL RECOVERY PLANTS
Semet-Solvay Engineering Corp.

BLOWERS
Connersville Blower Co., The.
Gas Engineering Co.
The Gas Machinery Co.
Pittsburgh Equitable Meter Co.
The P. H. & F. M. Roots Company.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

BLUE GAS PLANT
Bartlett-Hayward Co.
Indugas, Inc.
Gas Engineering Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

BOILERS (GAS FIRED)
P. M Lattner Mfg. Co.

BOILERS—WASTE HEAT
Bartlett-Hayward Co.
Combustion Engineering Corpn.
Improved Equipment-Russell Engineering Corp.
Isbell-Porter Company.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company.

BOOKKEEPING MACHINES
Remington Rand, Inc.

BOOSTERS
Connelly Iron Sponge & Governor Co.
Connersville Blower Co., The

BRICK
Fire and Checker
Botfield Refractories Co.
The Gas Machinery Co.
General Refractories Co.
Improved Equipment Co.-Russell Eng. Corp.
United Engineers & Constructors, Inc.
United States Refractories Corp. Silica
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
E. J. Lavino & Company.
United States Refractories Corp.

BRUSHES, PIPE CLEANING
Safety Gas Main Stopper Co.

B. T. U. INDICATORS
Alpha-Lux Co.

BUILDINGS
United Engineers & Constructors, Inc.

BURNERS (Industrial)
American Lava Corp.
The C. M. Kemp Mfg. Co.
Conversion
Cleveland Gas Burner & Appliance Co.
Conversion House Heating
Roberts Gas Burner Corp.
Fuel
Cleveland Gas Burner & Appliance Co.

BY-PRODUCT COKE
Semet-Solvay Co.

BY-PRODUCT PLANTS
Bartlett-Hayward Co.
Indugas, Inc.
The Gas Machinery Co.
International Coal Carbonization Co.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
West Gas Improvement Co.

CABLE RAILWAYS
C. W. Hunt Co., Inc.
Alpha-Lux Company.
American Meter Co.
Consolidated Ashcroft Hancock Inc., Co.

CALORIMETERS
John J. Griffin & Company.

CALORIMETER ACCESSORIES
American Meter Co.

CARBIDE
Union Carbide Sales Co.

CARBONIZATION
The Gas Machinery Co.
Low Temperature
International Coal Carbonization Co.

CARBURETTED WATER GAS
The Western Gas Construction Co.

CARBURETTED WATER GAS PLANTS
Bartlett-Hayward Co.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.

CARS
C. W. Hunt Co., Inc.

CASINGS, SEAMLESS STEEL
National Tube Co.

CAST IRON PIPE
Bell
Cast Iron Pipe Research Ass'n.
Spigot
Cast Iron Pipe Research Ass'n.

CEMENTS
Acid-proof
Botfield Refractories Company.
General Refractories Co.
Quigley Furnace Spec. Co., Inc.
Firebrick
Botfield Refractories Company.
General Refractories Co.
Improved Equipment-Russell Engineering Corp.
United States Refractories Corp.
High Temperature
Alpha-Lux Company.
Botfield Refractories Company.
General Refractories Co.
E. J. Lavino & Co.
Quigley Furnace Spec. Co., Inc.
United States Refractories Corp. Refractory
Botfield Refractories Company.
General Refractories Co.
Improved Equipment-Russell Engineering Corp.
E. J. Lavino & Co.
Refractory Engineering Corp.
United States Refractories Corp.

CHAMBER OVENS
United Engineers & Constructors, Inc.

CHARGING MACHINERY
Bartlett-Hayward Co.
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

CHUTES
Eaton-Kent, Inc.
C. W. Hunt Co., Inc.
Riter-Conley Company.
Robins Conveying Belt Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.

CLAMPS (PIPE)
S. R. Dresser Mfg. Co.

CLOCKS & WATCHES, Stop
American Meter Co.

COALS
Boone County Coal Corpn.
Logan County Coal Corp.
Westmoreland Coal Co

COAL GAS APPARATUS
Bartlett-Hayward Co.
Indugas, Inc.
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
Isbell-Porter Company.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Company
The Western Gas Construction Company.

COAL & COKE BINS CASTINGS
The Koppers Construction Co.
The Stacey Mfg. Co.

COAL AND COKE HANDLING MACHINERY
Bartlett-Hayward Co.
Dry Quenching Equipment Corp.
C. W. Hunt Co., Inc.
Isbell-Porter Company.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
United Engineers & Constructors, Inc.

COAL TAR PRODUCTS
International Combustion, Tar, and Chemical Corpn.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.

COAL TUBES
C. W. Hunt Co., Inc.
Meter
American Meter Co.
Superior Meter Co.
Service
American Meter Co.

COKE CRUSHERS
The Koppers Construction Co.

COKE QUENCHING
Dry Quenching Equipment Corp.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.

COKE RECLAMATION SYSTEMS
C. W. Hunt Co., Inc.

COMPUTERS
Heating Value
United Engineers & Constructors, Inc.

CONDENSERS
Aluminum Co. of America.
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
The Western Gas Construction Company.
High Duty
Stacey Bros. Gas Const. Co.
United Engineers & Constructors, Inc.

CONTRACTORS' TUBS
C. W. Hunt Co., Inc.

CONTROLS
The Bristol Company.
The Brown Instrument Co.
Robertshaw Thermostat Co.
Time-O-Stat Controls Co.
Combustion
Smoot Engineering Corp.
Gas Pressure
Smoot Engineering Corp.
Gas Producer
Smoot Engineering Corp.
Hot Water Heat System
The Cleveland Heater Company.
Water Gas Machine
Smoot Engineering Corp.

CONVEYORS
C. W. Hunt Co., Inc.
Isbell-Porter Company.
The Koppers Construction Co.

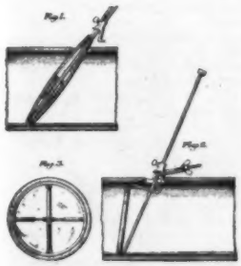
CONCENTRATORS, AMMONIA
(See Ammonia Concentrators.)

COOLERS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.
Air
Andale Company.
Ammonia Liquor
Andale Company.
Gas
Andale Company.
Oil
Andale Company.

COOLING COILS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

THE GOODMAN STOPPER

Used since 1897

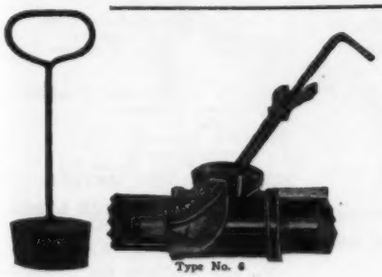


With improvements added from time to time, the newest feature is the "Z" Handle and cross-bar backing up the diaphragm.

The Locking Sleeve (shown in detail at right) holds the Stopper firmly in place.

LOOK FOR THE NAME

"GOODMAN"



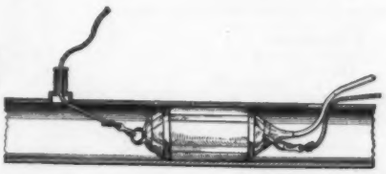
PLUGS

Many types for many uses.

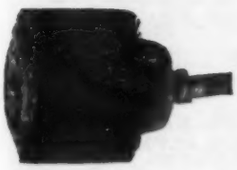
PIPE LINE SUPPLIES

GOODMAN CYLINDRICAL STOPPER

Inflatable for intermediate pressures



DEPENDABLE GAS MAIN BAGS



PIPE CLEANING BRUSHES

TYPE-A Seamless Rubber

TYPE-B Reinforced Seams

AIR - LINE MASK

Mask and blower in separate carrying cases.

VISIT BOOTH 88 KANSAS CITY

TYPE-C

Canvas covered, treated to resist action of oil. Used in oil lines while welding.

Cut shows Gas Bag Valve and Gauge Combination in use

SAFETY GAS MAIN STOPPER CO.

523 Atlantic Avenue **BROOKLYN, NEW YORK**

CABLE ADDRESS
GASTOPPER, N. Y.

PACIFIC COAST REPRESENTATIVE
C. B. BABCOCK CO., SAN FRANCISCO, CAL.

Buyers' Reference Index

See page 121 for advertisements of these products

COUPLINGS
Bartlett-Hayward Co.
S. R. Dresser Mfg. Co.
National Tube Co.
Pittsburgh Equitable Meter Co.
The P. H. & F. M. Roots Company.
Victaulic Co. of Amer.

COUPLINGS—FLEXIBLE
The P. H. & F. M. Roots Company.

CUTTING APPARATUS & SUPPLIES
Alexander Milburn Co.
Union Carbide & Carbon Co.

CRUSHERS
Riter-Conley Company.

CUBIC FOOT BOTTLES
American Meter Co.
Lambert Meter Co.

DE-EMULSIFIERS
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

DEHYDRATORS, GAS
Andale Company.
Semet-Solvay Engineering Corp.
West Gas Improvement Co.
The Western Gas Construction Company.

DEMONSTRATION METERS
Lambert Meter Co.

DIAPHRAGMS
Lambert Meter Co.
(Meter)
American Meter Co.

DISCHARGING MACHINERY
Bartlett-Hayward Co.
Improved Equipment-Russell Engineering Corp.
Semet-Solvay Engineering Corp.

DRAFT GAUGES
Brown Instrument Co., The
Consolidated Ashcroft Hancock Co., Inc.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.

DRYERS (Laundry)
W. E. Lamneck Co.

ELECTRIC LOCOMOTIVES
C. W. Hunt Co., Inc.

ELEVATORS
C. W. Hunt Co., Inc.
Craig Ridgway & Son Co.
Robins Conveying Belt Co.

ENGINE INDICATORS
Consolidated Ashcroft Hancock Co., Inc.

ENGINEERS
American Meter Co.
The Gas Machinery Co.
Combustion
Bartlett-Hayward Co.
The C. M. Kemp Mfg. Co.
Smoot Engineering Corp.
United Engineers & Constructors, Inc.
Consulting
Bartlett-Hayward Co.
United Engineers & Constructors, Inc.
George H. Waring.
The Western Gas Construction Company.
Contracting
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Company.
C. W. Hunt Co., Inc.
Isbell-Porter Company.
Riter-Conley Company.
Stacey Bros. Gas Const. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company.
Distribution
United Engineers & Constructors, Inc.
Measurement
American Meter Co.

EXHAUSTERS
Conneraville Blower Co., The
The Gas Machinery Co.
Isbell-Porter Company.
The P. H. & F. M. Roots Company.
The Western Gas Construction Company.

EXPANSION BENDS
The Gas Machinery Co.
Semet-Solvay Engineering Corp.

FILES (Steel and Wood)
Remington Rand, Inc.

FILES (Visible)
Remington Rand, Inc.

FILTERS, Gas
American Meter Co.

FIREBRICK, CEMENT
General Refractories Co.
Quigley Furnace Specialties Co., Inc.

FIREBRICK CHECKER BRICK (See Brick)
Botfield Refractories Company.
The Gas Machinery Co.
General Refractories Co.
Improved Equipment-Russell Engineering Corp.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

FIRST AID EQUIPMENT
United Engineers & Constructors, Inc.

FITTINGS
Isbell-Porter Company.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
U. S. Cast Iron Pipe and Foundry Co.
The Western Gas Construction Company.
Plain End and Flanged
Cast Iron Pipe Research Association.

FIXTURES
American Lava Corp.

FLOORS, IRON, BRICK, AND STEEL
The Gas Machinery Co.
Riter-Conley Company.
Semet-Solvay Engineering Corp.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

FLOW METERS
Brown Instrument Co., The
Lambert Meter Co.

FLUE PIPE (Cast Iron Oval)
James B. Clow & Sons.
Semet-Solvay Engineering Corp.

FURNACES
Combustion Engineering Corpn.
James B. Clow & Sons.
Gas Fired
The C. M. Kemp Mfg. Co.
Gas Soldering
American Meter Co.

GAS ANALYSIS APPARATUS
Metric Metal Works.

GASKETS
American Meter Co.
Consolidated Ashcroft Hancock Co., Inc.
Pittsburgh Equitable Meter Co.

GAS COAL
Boone County Coal Corpn.
Pittsburgh Coal Co.
Westmoreland Coal Co.

GASOMETERS (Test)
American Meter Co.

GAS PLANTS, COMPLETE
Indugas, Inc.
Gas Engineering Co.
Isbell-Porter Company.
United Engineers & Constructors, Inc.
West Gas Improvement Co.

GASSING MACHINE
American Meter Co.
Lambert Meter Co.

GAS TAPE
Connelly Iron Sponge & Governor Co.

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Metric Metal Works.

GATE VALVES (See Valves)

GATES—WIND & BLAST
The P. H. & F. M. Roots Company.

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The Bristol Company.
Brown Instrument Co., The
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Lambert Meter Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

GAUGES
American Meter Co.
The Bristol Company.
Brown Instrument Co., The
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Lambert Meter Co.
Maryland Meter Co.
Metric Metal Works.
Pittsburgh Equitable Meter Co.
The P. H. & F. M. Roots Company.
Taylor Instrument Companies.
Tagliabue Mfg. Co., C. J.
The Western Gas Construction Company.
Mercury
Precision Thermometer & Instrument Company.
Pressure-Recording
Consolidated Ashcroft Hancock Co., Inc.
D. McDonald & Co.
Precision Thermometer & Instrument Company.
Tagliabue Mfg. Co., C. J.
Siphon
Precision Thermometer & Instrument Company.
Tank
Precision Thermometer & Instrument Company.
Water
Precision Thermometer & Instrument Company.

GENERATORS, Oxygen & Acetylene
Alexander Milburn Co.

GLOVES
Rubber
Safety Gas Main Stopper Co.

GOVERNORS
Pittsburgh Equitable Meter Co.
Automatic
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.

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American Meter Co.
Coke Oven
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
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Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Helme & McIlhenny.
Isbell-Porter Co.
Smoot Engineering Corp.
Exhauster
Connelly Iron Sponge & Governor Co.
Connersville Blower Co., The
The Gas Machinery Co.
Isbell-Porter Co.
The P. H. & F. M. Roots Company.
Smoot Engineering Corp.
High Pressure
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.
Laboratory
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Connelly Iron Sponge & Governor Co.
Lambert Meter Co.
D. McDonald & Co.
Reynolds Gas Regulator Co.
Low Pressure
The Chaplin Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Lambert Meter Co.
Reynolds Gas Regulator Co.
Smoot Engineering Corp.
The Sprague Meter Co.
Retort House
Isbell-Porter Company.
Station
Helme & McIlhenny.

GRATES for Water Gas Generators
Semet-Solvay Engineering Corp.

GRAVITOMETERS
Precision Thermometer & Instrument Company.

GRIDS, for Scrubbers
Semet-Solvay Engineering Corp.

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Feed Water
Andale Company.
House
American Gas Products Corp.
Cleveland Gas Burner & Appliance Co.
The Cleveland Heater Company.
Roberts Gas Burner Corp.
Room
American Gas Products Corp.
American Stove Company.
Homestead Heater Company.
Welsbach Company.
Water
The Cleveland Heater Company.
Humphrey Company.
Ruud Mfg. Co.
Kompak Company.
Welsbach Company.
Pittsburg Water Heater Co.

HIGH CAPACITY METERS
Lambert Meter Co.

HIGH PRESSURE PIPE LINES
The Western Gas Construction Company.

HOISTS
The Gas Machinery Co.
C. W. Hunt Co., Inc.

HOLDERS
Bartlett-Hayward Co.
Cruse-Kemper Co.
Gas Engineering Co.
Riter-Conley Company.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.

HOPPERS—COAL AND COKE
Bartlett-Hayward Co.
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
Riter-Conley Company.
The Stacey Mfg. Co.

HOTELS
Shelburne Hotel.

HOWARD AUTOMATIC CHARGERS
The Western Gas Construction Company.

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Bartlett-Hayward Co.
Gas Engineering Co.
Improved Equipment-Russell Engineering Corp.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.

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American Meter Co.

HYDROMETERS
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.

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Kermit Incinerator Co.

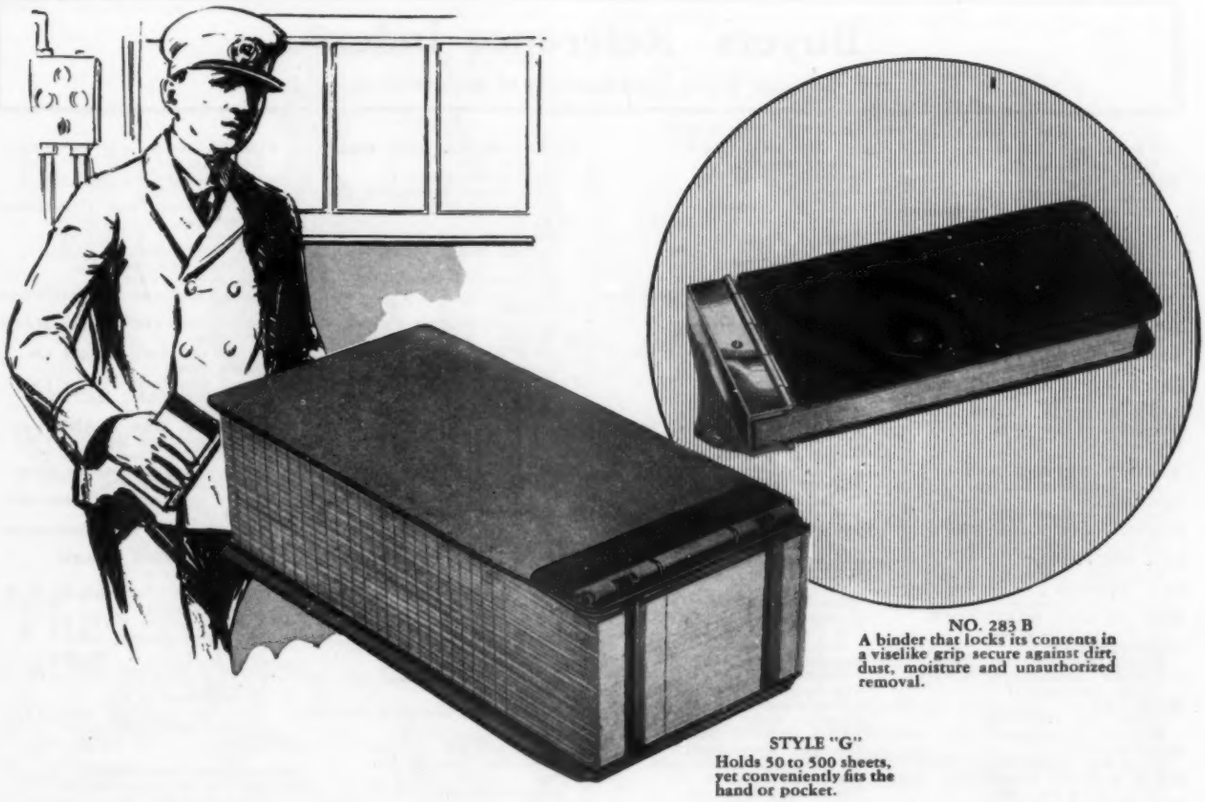
INDUSTRIAL GAS MIXERS
The C. M. Kemp Mfg. Co.
Roberts Gas Burner Corp.
Smoot Engineering Corp.

INDUSTRIAL TRACK
C. W. Hunt Co., Inc.

IRON BORING OXIDE
Gas Purifying Materials Co., Inc.

IRON SPONGE
Connelly Iron Sponge & Governor Co.

INSTRUMENTS
Alpha-Lux Company.
The Bristol Company.
Brown Instrument Co., The
Consolidated Ashcroft Hancock Co., Inc.
Lambert Meter Co.
Metric Metal Works.
Precision Thermometer & Instrument Company.
Taylor Instrument Companies.
Time-O-Stat Controls Co.



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Branch offices in all principal cities

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S. R. Dresser Mfg. Co.
Southwestern Pipe Joint & Engr. Co.
U. S. Cast Iron Pipe & Foundry Co.
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United Engineers & Constructors, Inc.
Victaulic Co. of Amer.

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Safety Gas Main Stopper Co.

LAMP POSTS
General Gas Light Co.

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W. E. Lamneck Co.

LAVA BURNER GRIDS
American Lava Corp.

LAVA PILOT TIPS
American Lava Corp.

LINING—REFRACTORY
(See Refractory Linings

LOCKERS
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LUX MATERIAL
Alpha-Lux Company.

LUX SPONGE
Alpha-Lux Company.

MANILA AND WIRE ROPE
C. W. Hunt Co., Inc.

MANOMETERS
Brown Instrument Co., The
Precision Thermometer & Instrument Company.

MANTLES
General Gas Light Co.
Welsbach Company.

MASKS—GAS
Safety Gas Main Stopper Co.

MAST & GAFF OUTFITS
C. W. Hunt Co., Inc.

MEASURING CHUTES
C. W. Hunt Co., Inc.

MECHANICAL GENERATORS for Water Gas App.
United Engineers & Constructors, Inc.

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American Meter Co.
Bartlett-Hayward Co.
S. R. Dresser Mfg. Co.
Lambert Meter Co.
D. McDonald & Co.
Maryland Meter Works.
Pittsburgh Equitable Meter Co.
Superior Meter Co.
Nathaniel Tufts Meter Works.

METER REPAIRING
Lambert Meter Co.

METER TESTER, Hydro-Pneumatic
American Meter Co.

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Brown Instrument Co., The
Pittsburgh Equitable Meter Co.
Air
American Meter Co.
Connersville Blower Co., The
The Gas Machinery Co.
Lambert Meter Co.
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Metric Metal Works.
The P. H. & F. M. Roots Company.
The Sprague Meter Co.
Superior Meter Co.
Nathaniel Tufts Meter Works.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.
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D. McDonald & Co.
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Demonstration
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American Meter Co.
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The Sprague Meter Co.
Superior Meter Co.
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Helme & McIlhenny.
Lambert Meter Co.
Maryland Meter Works.
D. McDonald & Co.
Metric Meter Works.
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The Sprague Meter Co.
Superior Meter Co.
Oil
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Connersville Blower Co., The
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Orifice
American Meter Co.
Positive
The Sprague Meter Co.
Prepayment
American Meter Co.
John J. Griffin & Company.
Maryland Meter Works.
D. McDonald & Company.
Metric Metal Works.
The Sprague Meter Co.
Superior Meter Co.
Nathaniel Tufts Meter Works.
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Connersville Blower Co., The
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Maryland Meter Works.
D. McDonald & Co.
Metric Metal Works.
The P. H. & F. M. Roots Company.
Nathaniel Tufts Meter Works.
The Western Gas Construction Company.
Steam
American Meter Co.
The Gas Machinery Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.
Test
American Meter Co.
John J. Griffin & Company.
Maryland Meter Works.
D. McDonald & Company.
Metric Metal Works.
The Sprague Meter Co.
Superior Meter Co.
Nathaniel Tufts Meter Works.
Wet Test
American Meter Co.

MILLER GRIP PACKING
Connelly Iron Sponge & Governor Co.

MIXERS, GAS
Roberts Gas Burner Corp.
Semet-Solvay Engineering Corp.
Smoot Engineering Corp.

MOISTURE DETERMINATORS
United Engineers & Constructors, Inc.

MOTOR CARS
C. W. Hunt Co .,Inc.

NAPHTHALENE EXTRACTORS
Bartlett-Hayward Co.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Western Gas Construction Company.

OFFICE FURNITURE
Remington Rand, Inc.

ORE, CHROME
F. J. Lavino & Co.

OVENS (REEL TYPE BAKE)
The Bruce McDonald Co.

OVENS—COKE AND GAS
Indugas, Inc.
The Gas Machinery Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.

OXIDE
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
Gas Purifying Materials Co., Inc.
E. J. Lavino & Co.

OXYGEN
Linde Air Products Co.

OXYGEN AND HYDROGEN METERS
Lambert Meter Co.

PACKING
Asbestos
Safety Gas Main Stopper Co.

PAINTS
Aluminum Co. of America.
Cheesman-Elliott Co.
Safety Gas Main Stopper Co.
The Stacey Mfg. Co.
Wailes Dove-Hermiston Corp.
Metal Protective
Aluminum Co. of America.
Semet-Solvay Co.

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Aluminum Co. of America.
Cheesman-Elliott Co.
Quigley Furnace Spec. Co., Inc.

PAINTS, RUSTPROOF
Aluminum Co. of America.
Cheesman-Elliott Co.
Quigley Furnace Spec. Co., Inc.

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PIOTS-SAFETY
Time-O-Stat Controls Co.

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Waylow Pipe Co.
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American Meter Co.
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Cast Iron
McWane Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Foundry Co.
Flange
Semet-Solvay Engineering Corp.
U. S. Cast Iron Pipe & Foundry Co.
Screw Joint Cast Iron Pipe
McWane Cast Iron Pipe Co.
Seamless Steel
Pittsburgh Steel Products Co.
Spigot
McWane Cast Iron Pipe Co.
Semet-Solvay Engineering Corp.
A. O. Smith Corp.
Naylor Spiral Pipe Co.
Steel
Bartlett-Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
National Tube Co.
Pittsburgh Steel Products Co.
Riter-Conley Company.
Semet-Solvay Engineering Corp.
A. O. Smith Corp.
Spiral Pipe
Naylor Spiral
Welded Steel
Bartlett-Hayward Co.
Cruse-Kemper Co.
The Gas Machinery Co.
National Tube Co.
Riter-Conley Company.
Semet-Solvay Engineering Corp.
A. O. Smith Corp.

PIPE COATINGS
Wailes-Dove-Hermiston Corp.

PLANTS—GAS, COMPLETE
The Gas Machinery Co.
Improved Equipment-Russell Engineering Corp.
The Koppers Construction Co.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
West Gas Improvement Co.
The Western Gas Construction Company.

PLATES
Cruse-Kemper Co.
C. W. Hunt Co., Inc.
The Stacey Mfg. Co.
The Western Gas Construction Company.
Floor
Gas Engineering Co.
The Gas Machinery Co.
Riter-Conley Company.
United Engineers & Constructors, Inc.

PLUGS, SERVICE AND MAIN
Rubber
Safety Gas Main Stopper Co.
Soft Wood
Safety Gas Main Stopper Co.

PORTABLE TEST METERS
Lambert Meter Co.

PRODUCER GAS PLANT
Gas Engineering Co.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

PRODUCER GAS STEAM
American Meter Co.

PROVERS—Critical Flow for H. P. Field Testing
American Meter Co.

PROVERS—METER
John J. Griffin & Company.
Helme & McIlhenny.
Lambert Meter Co.
D. McDonald & Co.
Pittsburgh Equitable Meter Co.
Superior Meter Co.

PUMPS
Drip
American Meter Co.
The Gas Machinery Co.
Lambert Meter Co.
D. McDonald & Co.
Gas
The P. H. & F. M. Roots Company.
Gas Bag
Safety Gas Main Stopper Co.
Hand
Lambert Meter Co.
Oil
Connersville Blower Co., The
The Gas Machinery Co.
D. McDonald & Co.
The P. H. & F. M. Roots Company.
Power
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Pressure
Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Service
American Meter Co.
Lambert Meter Co.
Superior Meter Co.
Service Cleaner
American Meter Co.
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Safety Gas Main Stopper Co.
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The P. H. & F. M. Roots Company.
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Connersville Blower Co., The
The P. H. & F. M. Roots Company.
Vacuum
American Meter Co.
Connersville Blower Co., The
The P. H. & F. M. Roots Company.

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Cruse-Kemper Co.
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Company.
The Koppers Construction Co.
Semet-Solvay Engineering Corp.
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Pittsburgh San Francisco

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PURIFYING MATERIALS
Alpha-Lux Company.
Connelly Iron Sponge & Governor Co.
The Gas Machinery Co.
Gas Purifying Materials Co., Inc
The Koppers Construction Co.
E. J. Lavino & Co.

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The Gas Machinery Co.
Semet-Solvay Engineering Corp.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
United Engineers & Constructors, Inc.
The Western Gas Construction Company.

PYROMETERS
Maryland Meter Works
The Bristol Company.
The Western Gas Construction Company.
Indicating
The Gas Machinery Co.
Taylor Instrument Companies.
United Engineers & Constructors, Inc.
Radiation
Taylor Instrument Companies.
Recording
The Gas Machinery Co.
Taylor Instrument Companies.
United Engineers & Constructors, Inc.

RADIATORS
Gas Steam
American Gas Products Corp.

RANGES—GAS
American Stove Co.
Eriez Stove Mfg. Co.

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Lambert Meter Co.
Maryland Meter Works

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Botfield Refractories Company
The Gas Machinery Co.
General Refractories Co.
Improved Equipment—Russell Engineering Corp.
E. J. Lavino & Co.
Quigley Furnace Spec. Co. Inc.
United States Refractories Corp.

REFRACTORY GUN
Botfield Refractories Company
Quigley Furnace Spec. Co. Inc.

REFRACTORY LININGS
Alpha-Lux Company
Botfield Refractories Company
The Gas Machinery Co.
General Refractories Co.
Improved Equipment—Russell Engineering Corp.
Quigley Furnace Spec. Co. Inc.
United Engineers & Constructors Inc.
The Western Gas Construction Company
United States Refractories Corp.

REGULATORS
American Meter Co.
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Connersville Co., The
Connelly Iron Sponge & Governor Co.
Groble Gas Regulator Co.
Isbell-Porter Co.
Pittsburgh Equitable Meter Co.
Reynolds Gas Regulator Co.
Robertshaw Thermostat Co.
Smoot Engineering Corp.
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Smoot Engineering Corp.
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Oven
American Stove Co.
Oxygen & Acetylene
Alexander Milburn Co.
Steam Pressure
Smoot Engineering Corp.

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Lambert Meter Co.

RESPERATING OUTFITS
Connelly Iron Sponge & Governor Co.

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Horizontal and Inclined
Improved Equipment—Russell Engineering Corp.
Vertical
United Engineers & Constructors Inc.
West Gas Improvement Co.
Silica and Clay
Improved Equipment—Russell Engineering Corp.
The Gas Machinery Company
United States Refractories Corp.

RETORT CEMENT
Alpha-Lux Company
Botfield Refractories Company
The Gas Machinery Co.
Improved Equipment—Russell Engineer Corp.
Quigley Furnace Spec. Co. Inc.
United States Refractories Corp.

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Connelly Iron Sponge & Governor Co.

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Reynolds Gas Regulator Co.

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Remington Rand Inc.

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Connelly Iron Sponge & Governor Co.

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Cruse-Kemper Company
Gas Engineering Co.
The Gas Machinery Co.
Isbell-Porter Co.
Semet-Solvay Engineering Corp.
Stacey Bros. Gas Const. Co.
The Stacey Mfg. Co.
West Gas Improvement Co.
The Western Gas Construction Company

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The Stacey Mfg. Co.

SERVICE CLEANERS
American Meter Co.

SERVICE PLUG-RUBBER
Connelly Iron Sponge & Governor Co.
Safety Gas Main Stopper Co.

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Remington Rand Inc.

SKIP HOIST
C. W. Hunt Co. Inc.

SPECIFIC GRAVITY APPARATUS
American Meter Co.

SPECIFIC GRAVITY GAUGES
Alpha-Lux Company.

SPONGE
Alpha-Lux Company
Connelly Iron Sponge & Governor Co.
Gas Purifying Materials Co. Inc.

SPRAYS, for Water Gas Machines
Semet-Solvay Engineering Corp.

SPRAYERS, PAINT
Alexander Milburn Co.

STACEY BULLETT for High Pressure Storage
Stacey Bros. Gas Construction Co.

STATION METERS (See Meters Station)

STEAM ACCUMULATORS
(See Accumulators—Steam)
The Gas Machinery Co.
Smoot Engineering Corp.
United Engineers & Constructors Inc.
The Western Gas Construction Company

STOPPERS
Safety Gas Main Stopper Co.

STRAINERS—GAS, STEAM, WATER
Andale Company

STREET DEPT. EQUIPMENT
American Meter Co.
Connelly Iron Sponge & Governor Co.
Safety Gas Main Stopper Co.

STREET LAMPS
Welsbach Street Lighting Co.

SULPHUR AND AMMONIA TEST (Apparatus)
American Meter Co.

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Combustion Control
The C. M. Kemp Mfg. Co.
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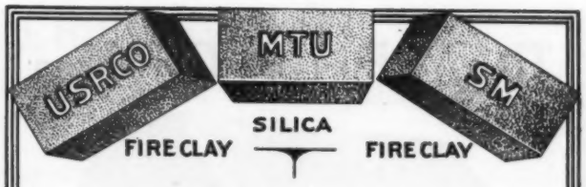

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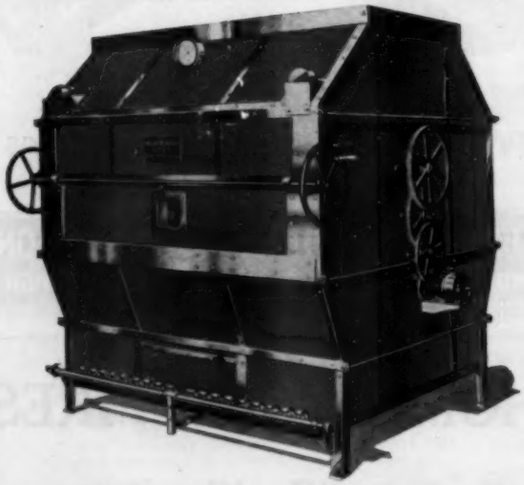

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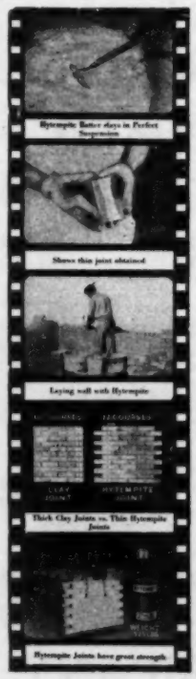

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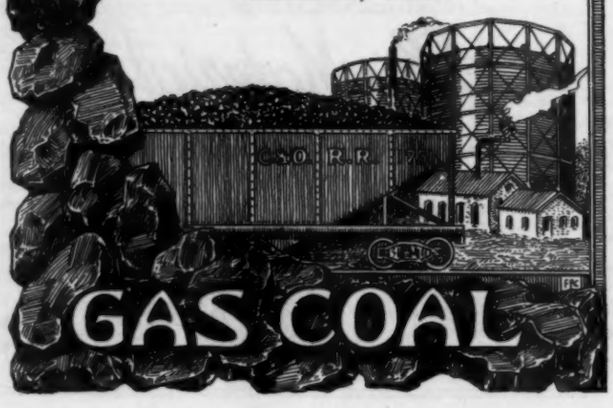

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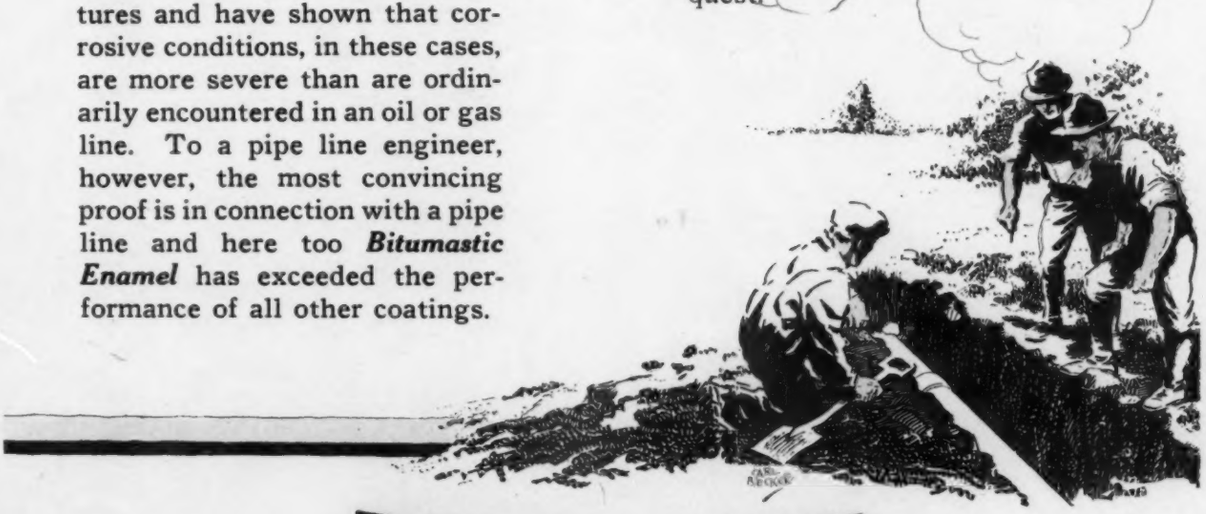

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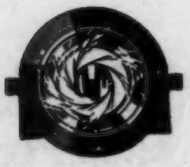
This  machine applies this $F_c = \frac{Wv^2}{gR}$ formula and makes a cast iron pipe which is 25% stronger

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